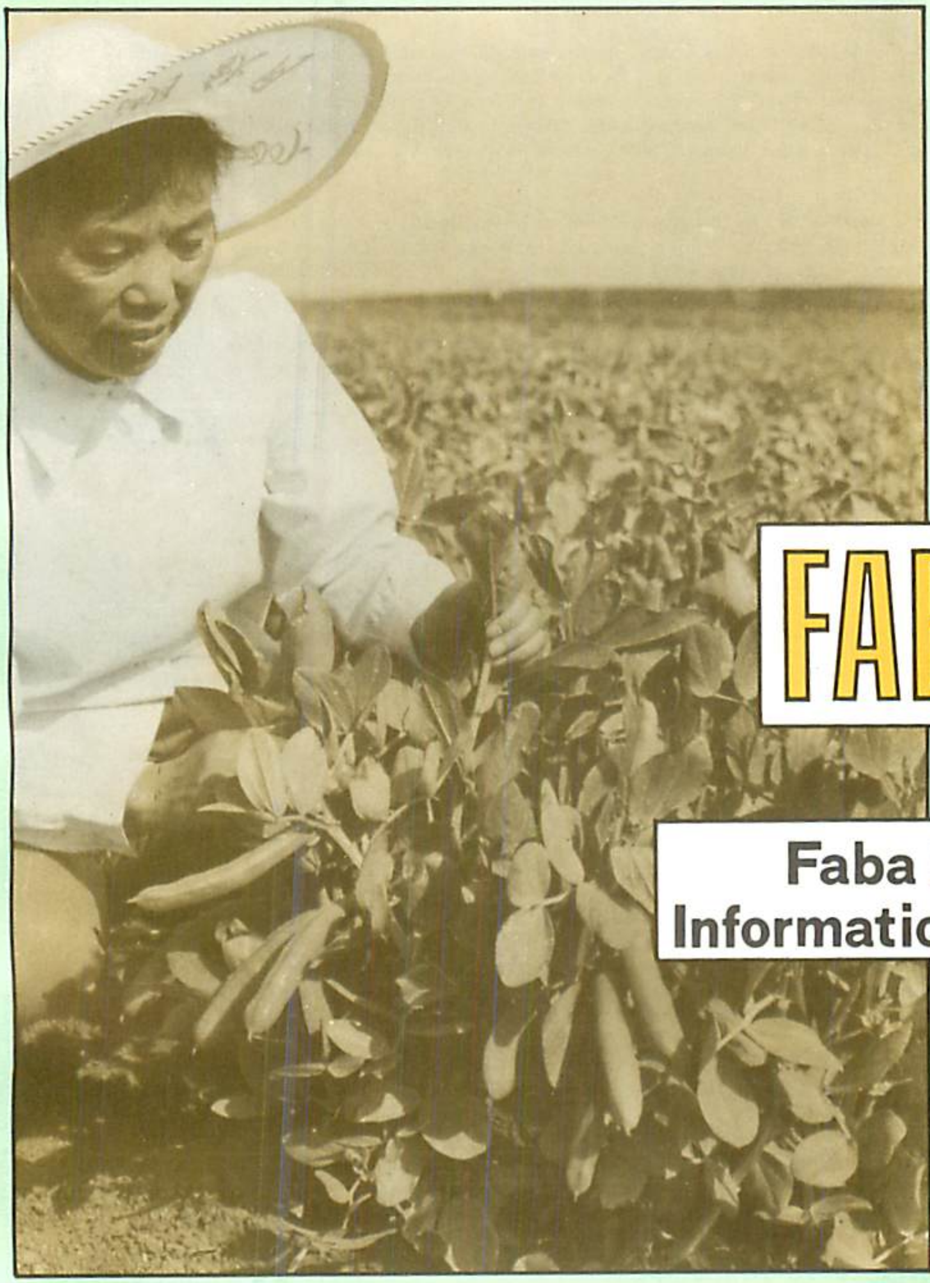

FABIS

Faba Bean Information Service

NEWSLETTER
No.17
April 1987

INTERNATIONAL CENTER FOR AGRICULTURAL RESEARCH IN THE DRY AREAS

(ICARDA)

ICARDA and CGIAR

The overall objective of the International Center for Agricultural Research in the Dry Areas (ICARDA) is to increase agricultural productivity and food availability in both rural and urban areas, thus improving the economic and social well-being of people in developing countries, particularly in North Africa and West Asia. The center focuses mainly on winter rainfall areas with 200-600 mm annual precipitation. When appropriate, research also covers environments with monsoon rainfall or irrigation.

ICARDA is a world center for the improvement of barley, lentil, and faba bean, and a regional center for improving wheat, chickpea, farming systems, livestock, and pasture and forage crops. The training of agricultural researchers from developing countries and the communication of research results are an important part of ICARDA's activities.

ICARDA is a non-profit research center established in 1977 by the Consultative Group on International Agricultural Research (CGIAR). The CGIAR, an informal association of donors including governments, organizations, and private foundations, supports agricultural research worldwide to improve food production in developing countries, through a network of 13 international research institutions, including ICARDA. The network covers crop and livestock systems that supply three-quarters of the food of the developing world.

FABIS

FABIS Newsletter is produced three times a year at ICARDA with the financial support of the International Development Research Center (IDRC), Ottawa, Canada. FABIS, the newsletter of the Faba Bean Information Service, is a forum for communicating faba bean research results. Short research articles provide rapid information exchange, and comprehensive reviews are invited regularly on specific areas of faba bean research. The newsletter also includes announcements. The Faba Bean Information Service provides information on faba bean research free of charge through a question and answer service, photocopies, and searches of a faba bean document collection.

DEADLINE: Contributions must reach FABIS for No. 18 by 30 June, for No. 19 by 31 October 1987 and for No. 20 by 28 February 1988.

SUBSCRIPTIONS: FABIS Newsletter is available free to faba bean researchers under an IDRC grant. To subscribe, write: FABIS/Documentation Unit/ICARDA/P.O. Box 5466/Aleppo, Syria.

COVER PHOTO: A visiting scientist, Lang Li Juan, from China examines some of ICARDA's faba bean breeding trials.

ISSN 0255 6448

FABIS

Faba Bean Information Service

NEWSLETTER 17 April 1987

CONTENTS

SHORT COMMUNICATIONS

Breeding and Genetics

Diallel Analysis of Five Faba Bean Parents for Cowpea Seed Beetle Infestation

E.A. Waly[1], S.A. Abd El-Aal[1] and M.H. Hussein[2]
1. Horticulture Department, College of Agriculture, Assiut University, Assiut, EGYPT
2. Plant Protection Department, College of Agriculture, Assiut University, Assiut, EGYPT

Abstract

A half-diallel cross involving five parents of faba bean (*Vicia faba* L.) was evaluated for cowpea seed beetle (*Callosobruchus maculatus* F.) infestation. F_1 hybrids were generally more resistant than the parents. There was a highly significant general combining ability (GCA) component and a large specific combining ability (SCA) effect, although the former was less than the latter. Estimates of GCA effects of parents and SCA of F_1 hybrids were calculated and are discussed.

Introduction

Cowpea seed beetle (*Callosobruchus maculatus* F.) is one of the most destructive pests of stored faba bean (*Vicia faba*) seeds in Egypt (Attia and Kamel 1966) and *reduces the* quality and food value of stored seeds. El-Sawaf (1956) found that infestation by *C. maculatus* could reduce the weight of the stored crop by over half in a period as short as 3 months. After screening germplasm, Singh (1978) found only one cowpea variety *resistant to C. maculatus.* Because of the high costs of using insecticides, the development of resistant cultivars is essential.

The objective of this investigation was to study the genetic behavior of some inbred faba bean parents against cowpea seed beetle in a diallel crossing system.

Materials and Methods

Percent infestation was determined on seeds obtained from a diallel cross of five inbred parents and 10 F_1's. The parents were Somali (P_1), Balady (P_2), Kobrosi (P_3), Long Equadore (P_4), and Bunyard's Exhibition (P_5). Natural infestation was recorded in closed paper bags 5 months after harvest using 100 seeds of each genotype in three replicates.

Infestation was also simulated using 10 dry seeds of each genotype. Seeds were placed in petri dishes in triplicate and left for 24h with 50 adults of *C. maculatus.* The percent infestation was recorded 45 days later. All tests were carried out in a clean store at 25+1°C and 70+5% relative humidity. The data were analyzed according to Griffing (1956 b) method 2, model 1 and Jinks (1954).

Results and Discussion

Natural infestation exhibited a marked difference between the parents and the F_1 hybrids in the diallel cross experiment. The mean percent infestation of the five parents used was 71.1 and the hybrids 6.81. This indicates that F_1 progenies were generally more resistant than the parents. The apparent reduction in percent infestation in F_1 seeds might be explained by increased vigor of the hybrid or by dominant gene action for insect resistance in the over-dominance range. This difference was not very clear from observations of the artificial infestation since in this case the mean parent infestation was 28.98% and in the hybrids 32.7%.

The graphical analyses of the diallel cross data for natural and artificial infestation are illustrated in Figs. 1a and 1b.

The regression line for natural infestation has a slope $b = 0.567 \pm 0.162$, which is significantly different from zero but not from unity. Also, the line cuts the

Wr axis well below its origin, indicating the presence of over-dominance. None of the points on the graph departs markedly from the regression line.

For artificial infestation (Fig. 1b), the slope of the regression line was low (b = 0.333±0.211) and was associated with a large error causing the slope to be not significantly different from zero or unity. The line cuts the Wr axis below the origin, which is indicative of over-dominance.

Partitioning of the variance due to genotypes into general (GCA) and specific (SCA) combining ability components gave the values shown in Table 1.

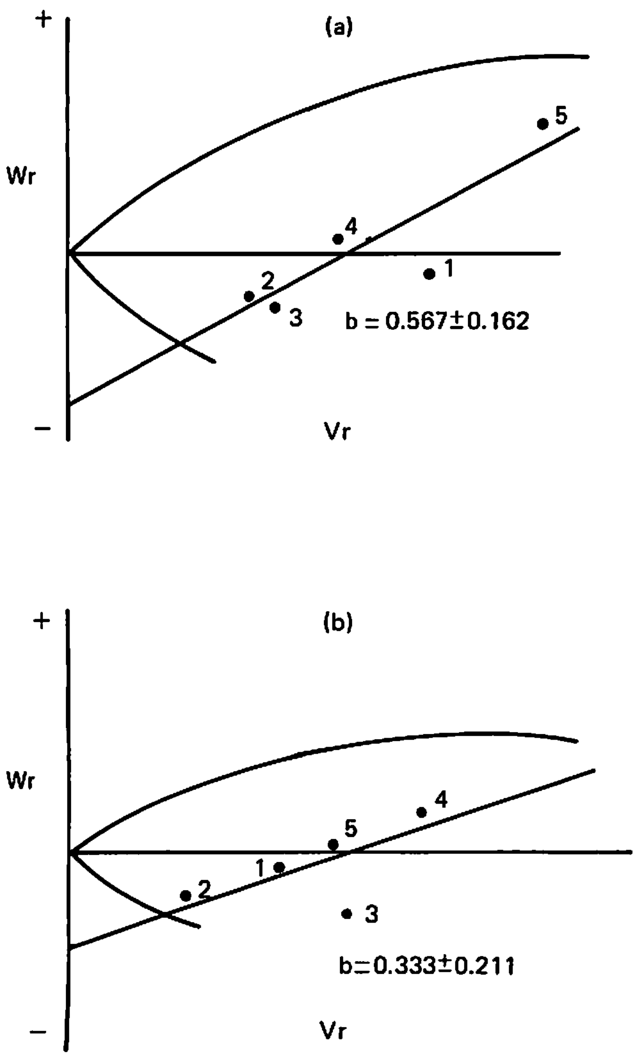

Fig. 1. Variance/covariance graphs for (a) natural infestation, and (b) artificial infestation in F_1 diallel cross of five parents of faba bean.

Table 1. Analysis of variance of data under natural and artificial infestation in a 5x5 diallel cross of inbred parents of faba bean.

Infestation	Degrees of freedom	Mean square	F ratio
Natural			
GCA	4	190.7	676.5**
SCA	10	1614.1	5724.0**
Artificial			
GCA	4	144.4	534.5**
SCA	10	281.1	1040.6**

**Significant at P=0.01.

The analysis shows highly significant GCA and large SCA for both natural and artificial infestation. The mean squares for SCA were larger than those for GCA, indicating that the non-additive type of genetic variance is more prevalent.

In situations with a significant SCA value, together with the apparent reduction in percent infestation to F_1 and the absolute difference between parents and F_1, it is likely that the production of F_1 hybrid varieties would be the best means of obtaining fullest expression of resistance.

The estimation of GCA values under natural infestation revealed significant positive GCA effects (high infestation) for parents 1 and 5. The significant negative effects (low infestation) were recorded for parents 2, 3, and 4 with parent 3 showing the maximum effect. Under artificial infestation, the parents showed the same behavior as under natural infestation although parent 4 showed the maximum negative effect (Table 2).

The SCA estimates of the hybrids under natural and artificial infestation are given in *Table 3. Under* natural infestation, only one cross (P_1 x P_2) showed significant positive SCA effects (high infestation). The other crosses showed significant negative SCA effects.

Under artificial infestation, the crosses P_1 x P_2, P_2 x P_4, P_3 x P_4, and P_4 x P_5 showed significant negative SCA effects while crosses P_2 x P_4, P_3 x P_4, and P_4 x P_5 showed the same effect under both natural and artificial infestation.

Table 2. GCA effects for the arrays in the natural and artificial infestation data of the 5x5 diallel cross.

Parents	Natural infestation	Artificial infestation
1	+7.36**	+7.52**
2	-2.50**	-2.32**
3	-6.32**	-0.98**
4	-1.20**	-4.42**
5	+2.66**	+0.20**
SE (g_i-g_j)	±0.57	±0.13

**Significant at P=0.01.

Table 3. SCA effects for the individual cross combinations in the natural and artificial data of the 5 x 5 diallel cross.

Cross	Natural infestation	Artificial infestation
1x2	+14.87**	-14.38**
1x3	-29.31**	+7.99**
1x4	-25.77**	+16.72**
1x5	-35.79**	+22.09**
2x3	-17.44**	+14.83**
2x4	-21.22**	-11.40**
2x5	-26.91**	+8.63**
3x4	-18.58**	-25.06**
3x5	-24.60**	+2.63**
4x5	-29.72**	-9.59**
SE (S_{ij}-S_{ik})	±0.99	±0.78
(S_{ij}-S_{kl})	±1.28	±0.65

**Significant at P=0.01.

This study showed the existence of important genetic variation which is readily available for the plant breeder. Because the percent infestation showed a highly significant specific combining ability component, it can only be finally assessed by making the appropriate hybrids.

References

Attia, R. and Kamel, A.H. 1966. The fauna of stored products in U.A.R. Bulletin de la Societe Entomologique d'Egypte 49: 221-232.

El-Sawaf, S.K. 1956. Some factors affecting the longevity, oviposition and rate of development in the southern cowpea weevil, *Callosobruchus maculatus* F. (Coleoptera: Bruchidae). Bulletin de la Societe Entomologique d'Egypte 40: 29-95.

Griffing, B. 1956 a. A generalized treatment of the use of diallel cross in quantitative inheritance. Heredity 10: 31-50.

Griffing, B. 1956 b. Concept of general and specific combining ability in relation to diallel crossing systems. Australian Journal of Biological Sciences 9: 463-493.

Jinks, J.L. 1954. The analysis of continuous variation in a diallel cross of *Nicotina rustica* varieties. Genetics 39: 767-788.

Singh, S.R. 1978. Resistance to pests of cowpea in Nigeria. *In* Pests of Grain Legumes: Ecology and Control (Singh, S.R., Van Emden, H.F. and Ajibola Taylor, T., eds.). Academic Press, London, UK. 454 pp.

تحليل متبادل (Diallel) لخمس آباء من الفول من حيث اصابتها بخنفساء بذور اللوبياء

ملخص

اجرى تقييم لتهجين نصف النظائر half-diallel cross بين خمسة آباء من الفول (Vicia faba) من حيث اصابتها بخنفساء بذور اللوبياء (Callosobruchus maculatus) وتبين ان هجن الجيل الاول F_1 كانت أشد مقاومة على العموم من آبائها . كما تبين وجود مكون القدرة التوافقية العامة (GCA) General Combining ability وبشكل معنوى جدا اضافة الى تاثير كبير في القدرة التوافقية النوعية (SCA) Specific combining ability، مع ان الاولى كانت أقل من الثانية . كما حسبت ونوقشت تقديرات تاثير (GCA) للاباء و (SCA) لـهجن الجيل الاول .

Genetic Instability of Violet Seed Coat Color in Vicia faba Indicates Mobility of a Transposable Genetic Element

I. Schubert and O. Avrich
Zentralinstitut fuer Genetick und Kulturpflanzenforschung der AdW der DDR, DDR - 4325 Gatersleben, EAST GERMANY

Abstract

A dominant mutant for violet seed coat color appeared in a cross between two inbred lines of *Vicia faba* both with beige/brown seeds, and occasionally, variegation of anthocyanidine synthesis occurred in its progeny from self-pollination. This indicates mobility of a transposable element.

Introduction

Transposable elements characterized at the molecular level are presently known for *Zea mays*, *Anthirrinum majus*, and *Glycine max*. Unstable mutants indicating transpositional activity of such elements have been described for more than 30 plant species but not for *Vicia faba* (Nevers *et al.* 1986).

Most wild forms of *V. faba* and other legumes have dark colored seeds, while in most cultivated varieties of *V. faba* the seeds are beige or brown (pale buff to buff). Violet, black, red, green, or completely unpigmented seeds have also been observed in some lines (Sjodin 1971).

In *V. faba*, testa color is normally expressed in the maternal integument (Muratova 1931) and no xenia effects have been observed (Ricciardi *et al.* 1985). This means that the color of a seed is not necessarily indicative of its genotype.

We followed the mode of inheritance of violet seed color which arose anew as a dominant character in a cross between two inbred lines of the variety Kleine Thuringer, which had beige or brown seeds for many generations. Instability (variegation) of violet seed coat color (in the heterozygous state) was observed in some individuals. A preliminary chemical characterization of violet seed color was performed.

Materials and Methods

Two homozygous translocation lines (J = tI_s-V_s and K = tI_s-VI_l) were crossed. The resulting double heterozygotes form multivalents at meiosis and from these either the parental karyotypes or, by missegregation, karyotypes with altered chromosome number (seven acrocentrics instead of one metacentric plus five acrocentrics, Fig. 1 and Schubert and Rieger 1985) may segregate. One of these heterozygous plants produced seven violet seeds instead of beige or brown seeds. Its offspring were analyzed over three to five generations for karyotype structure and seed color.

Extraction and hydrolysis of dry testae were performed according to Bate-Smith (1953), followed by thin layer chromatography of the extracts on cellulose according to Bate-Smith (1954). The pigment bands were eluted with 0.01N HCl in methanol and the spectra obtained with a spectrophotometer (SPECORD M 40, VEB Carl Zeib Jena) were compared with the data of Swain (1976).

Results and Discussion

The deep violet color of the HCl extracts from the testae of the mutant faded through blue to colorless after alkalinization. This phenomenon and the maxima of the spectra between 540 and 555 nm (dependent on the acidity of the solution) are typical for anthocyanidines (Swain 1976). The Rf values of the pigment spots obtained by thin layer chromatography suggest, according to Harborne (1958), that a mixture of delphinidine, cyanidine, and malvidine (in decreasing concentration) is responsible for the violet color of the testae. Extracts from testae of the parental translocation lines J and K with beige or brown seeds (but violet spots on corolla and stipula) revealed violet color only after hydrolysis in 2N HCl at 100°C. This is indicative of the presence of leukoanthocyanes and repression of the last step(s) transforming these into the final anthocyanidine species.

Six of the seven violet seeds from the mutant plant heterozygous for translocations J and K resulted in plants that continued to produce violet seeds after self-pollination, and only one produced beige seeds. The seeds of the six plants were grown and self-pollinated again. From these, 70 fertile F_2 plants were grown. Thirteen (18.6%) of these produced seeds with beige and 57 with violet testae. Thus violet seed color is dominant over beige in this case and is maternally expressed.

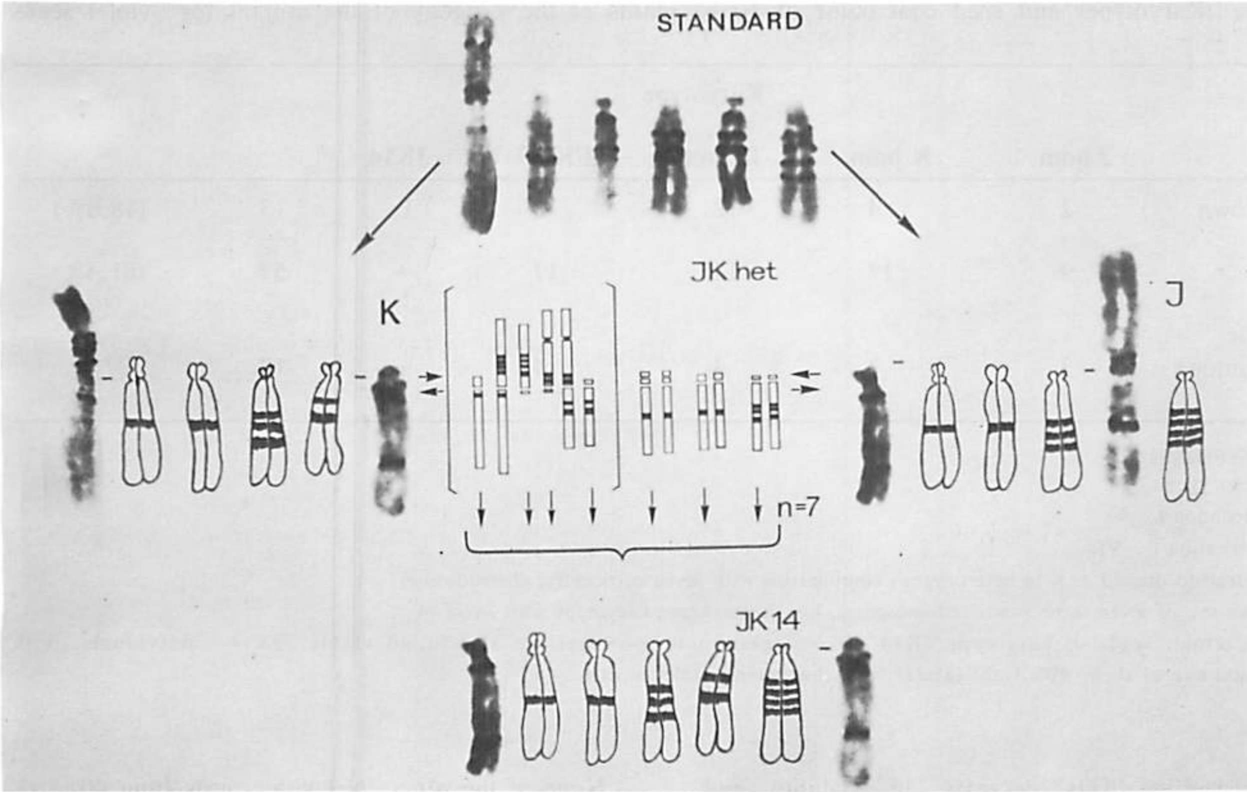

Fig. 1. Segregation of parental karyotypes and karyotypes with altered chromosome number from double heterozygotes.

There are conflicting reports in the literature on the mode of inheritance of violet seeds. While Heuser (1923), Picard (1963), Sjodin (1971), and Ricciardi *et al.* (1985) found violet to be dominant, Erith (1930) and Sirks (1931) reported buff to be dominant over *violet* in the lines they investigated. Kaznowski (1923), Erith (1930), and Sirks (1931) described an intermediate mode of inheritance of violet versus 'drab greyish' seed coat color.

Therefore, it might be that more than one allele exists for either violet or 'normal' (or both) seed color. Since there was no cosegregation of the recessive beige or brown seed color and one of the three chromosome sets may segregate from a JK het plant (Table 1), the chromosomes I, V, and VI which are involved in the translocations J and K do not contain the gene for violet testae.

Additional crosses of plants homozygous for violet seed color and for translocation J were done with two lines with beige seeds and translocations involving chromosomes II/III and III/IV, respectively. This revealed that chromosome II carries the gene for violet testae.

The sudden appearance of violet testae as a dominant character in a double heterozygote whose ancestors have produced beige or brown seeds for decades, most probably means that the allele for violet testae became reactivated from a silent condition over many generations as mutations from recessive to dominant are very uncommon (Nilan 1967).

There are two possible explanations for this. Either a base substitution was reversed or an inactivated transposon was excised leading to reactivation of the vio^+ allele. The following data support the second hypothesis. Thirteen out of seventy F_2 plants produced spotted or mottled in addition to violet seeds (either violet spots or. a beige background or vice versa, see Fig. 2). The spotted and violet seeds also varied in other morphological features. In 16 out of 22 cases they were smaller than the normal seeds, shrunken, and/or with burst testae. Such variability occurred less frequently among the homogeneously colored sister seeds of the same descent Twelve out of the 22 seeds with variegated expression of violet seed color did not germinate at all, while the remaining plants showed reduced vigor and fertility (two plants set only one seed each), and three were

Table 1. Karyotypes and seed coat color of 70 F_2 plants of the progeny of the mutant for violet seeds (JK het).

Seed color	Karyotype						
	J hom	K hom	JK het	J/K+7	JK14		
Beige/brown	2	4	2	4	1	13	(18.6%)
Violet	9	17	14	17	+	57	(81.4%)
Spotted or mottled among violet	3	2	4	4	+	13	

hom = homozygous
het = heterozygous
J = translocation I_s - V_s
K = translocation I_s - VI_1
J/K+7 = translocation J or K in heterozygous combination with seven acrocentric chromosomes
JK14 = two sets of seven acrocentric chromosomes, i.e., homozygous karyotype with 2n = 14
+ = five violet seeds of karyotype JK14 did not germinate, however we also found viable JK14 individuals with violet seeds, one of them with light lateral spots harboring violet mottle.

completely sterile. This decrease in viability and fertility is not due to karyotypic heterozygosity since karyotypically homozygous progeny also showed variegation combined with the same destabilizing effects (Table 1). The seven at least partially fertile plants set a total of 68 seeds and two of them had a light spot on a violet background and dark spots on light violet background, respectively. These two resulted in plants which produced exclusively violet seeds. Only one of the 68 seeds showed violet mottle on a beige background and this grew into a plant producing only violet seeds. The remaining 65 seeds were completely violet. An F_3 individual grown from a violet seed also produced one mottled seed, which gave no viable plant, and 25 violet seeds.

None of the nine violet sister seeds from three F_2 plants that also produced mottled seeds resulted in a viable plant. Five out of 25 sister seeds of the spotted seed of appeared in F_3 produced beige and 14 violet seeds. Recently, however, a plant from mottled seed produced five small mottled seeds, and a plant from a violet sister produced six mottled seeds. Therefore, the plants producing variegated seeds often also set seeds of low viability. However, the viable and fertile progeny of these plants in the majority return to stably expressed homogeneous seed coat color. This is similar to the *situation in Z. mays* (McClintock 1978) in which, after induction of transposition via bridge-breakage-fusion (BBF) cycles, unstable expression of various genes in connection

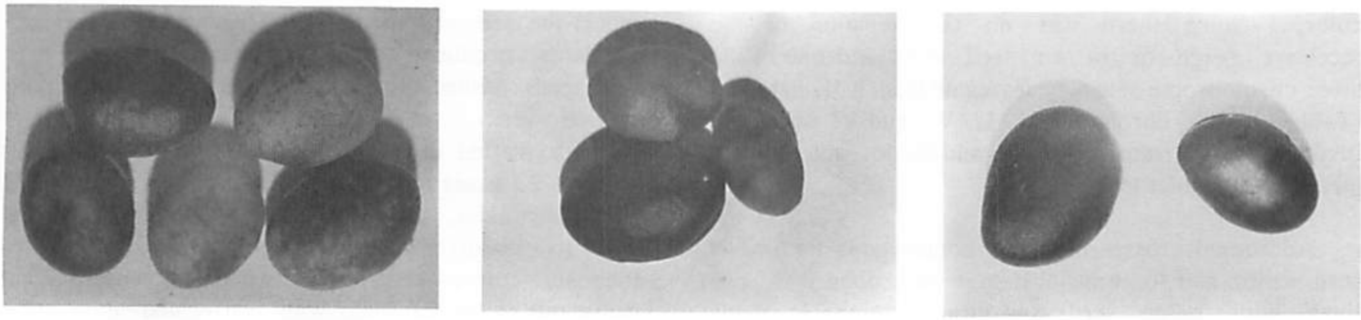

Fig. 2. Seeds from F_2 plants (a) violet, violet spots on beige background, and beige spots on violet background; (b) violet and beige; and (c) violet, small and large.

with increased lethality was observed in *Z. mays*. However in the progeny, expression of the genes in question became stabilized again when BBF cycles and transpositions ended.

Thus our data indicate mobility of a transposable genetic element in *V. faba* that for generations was present in the vio locus and switched off expression of violet seed color.

A similar phenomenon was observed in a landrace of *V. faba* from Spain, which had seeds that were beige or brown, violet, and violet mottle on light violet in about 30, 60, and 10% of cases, respectively (P. Hanelt and B. Fouquet, Gatersleben, personal communication). In contrast, Ricciardi *et al.* (1985) reported a *V. faba* line from Peru with spotted seeds as a dominant character, regardless of the seed color of the lines with which it was crossed. Mobility of the presumed transposon in these lines might be restricted to the developmental stage of maternal cells during which seed color becomes expressed. The presence of such 'domesticated' transposons is also indicated by the frequent (regular) occurrence of spotted or mottled seeds among other cultivated legumes, for instance *Phaseolus vulgaris* (Hammer 1984).

Characterization of a transposable element of *V. faba* in molecular terms would be of interest for comparison with elements of other species as well as for gene tagging and possibly also gene transfer.

Acknowledgement

We thank Prof. Dr. R. Rieger for his critical reading of the manuscript and helpful suggestions.

References

Bate-Smith, E.C. 1953. Colour reactions of flowers attributed to (a) flavonols and (b) carotenoid oxides. Journal of Experimental Botany 4: 1-9.

Bate-Smith, E.C. 1954. Leuco-anthocyanins. I. Detection and identification of anthocyanidins in plant tissue. Biochemical Journal 58: 122-125.

Erith, A.G. 1930. The inheritance of color, size and form of seeds and of flower colour in *Vicia faba* L. Genetica 12: 477-510.

Hammer, K. 1984. Das Domestikationssyndrom. Kulturpflanze 32: 11-34.

Harborne, J.B. 1958. The chromatographic identification of anthocyanin pigments. Journal of Chromatography 1: 473-488.

Heuser, W. 1923. Beobachtungen uber Farbvariationen der Samenschale von *Vicia faba* L. Zeitschrift fuer Pflanzenzuechtung 9: 178-184.

Kaznowski, L. 1923. Etudes sur la feve (*Vicia faba* L.) I. Feverole de vistule. Mem. Inst. Nation. Polon. 4: 50-86.

McClintock, B. 1978. Mechanisms that rapidly reorganize the genome. Stadler Genetics Symposium 10: 24-47.

Muratova, V.S. 1931. (Common beans (*Vicia faba* L.). In Russian. Bull. Appl. Bot. Genet Plant Breeding, Suppl. 50: Leningrad. 298pp.

Nevers, P., Sheperd, N.S. and Saedler, H. 1986. Plant transposable elements. Pages 103-203 *in* Advances in Botanical Research. Volume 12. Academic Press Inc., London, UK.

Nilan, R.A. 1967. Nature of induced mutations in higher plants. Pages 5-20 *in* Proceedings of a Symposium on Induced Mutations and their Utilization. Erwin-Baur-Gedachtnisvorlesungen IV 1966, Akademie-Verlag, Berlin.

Picard, J. 1963. La coloration des tegumentes du grain chez la feverole (*Vicia faba* L.) etude de l'heredite des differentes colorations. Annales de l'Amelioration des Plantes 13: 97-117.

Ricciardi, L., Filipetti, A., De Pace, C. and Marzano, C.F. 1985. Inheritance of seed coat colour in broad bean (*Vicia faba* L.). Euphytica 34: 43-51.

Schubert, I. and Rieger, R. 1985. A new mechanism for altering chromosome number during karyotype evolution. Theoretical and Applied Genetics 70: 213-221.

Sirks, M.J. 1931. Beitrage zu einer genotypischen Analyse der Ackerbohne, *Vicia faba* L. Genetica 13: 209-631.

Sjodin, J. 1971. Induced morphological variation in *Vicia faba* L. Hereditas 67: 155-180.

Swain, T. 1976. Flavonoids. Pages 166-205 *in* Chemistry and Biochemistry of Plant Pigments. Volume 2. Second edition. Academic Press, London UK.

عدم الاستقرار الوراثي لغلاف البذرة البنفسجي في الفول Vicia faba يشير الى تحرك العنصر الوراثي القابل للانتقال

ملخص :

ظهرت طفرة سائدة لغلاف بذرة بنفسجي اللون في تهجين بين سلالتين داخلية الاستيلاد inbred lines من الفول وكلاهما بذوره بيج/بني ، وفي بعض الاحيان حصل تبرقش في التركيب الانثوسيانيني anthocyanidine في نسله نتيجة التلقيح الذاتي . وهذا يشير الى قابلية تحرك العنصر الوراثي المتنقل .

Stability Parameters of Important Characters in Various Types of Faba Bean

K. Ibrahim and P. Ruckenbauer
Institute for Plant Breeding, Seed Technology and Population Genetics, University of Hohenheim, D - 7000 Stuttgard 70, WEST GERMANY.

Abstract

The yield stability of eight faba bean (*Vicia faba* L.) varieties was studied in Great Britain and France across nine environments. The varieties were categorized into a small seeded group (Maris Bead, Blaze, Dacre, Kristall, and Herra) and a large seeded group (Felix, Minica, and Wierboon C.B.). The two groups were different in plant height, pod profile, and earliness. All varieties were analyzed for their stability. Simple correlation between stability parameters for yield and those for yield components and other characters were determined. Significant variety x environment interactions were detected for seed yield and other characters. The variation in the linear and non-linear components of the V x E interactions indicated significant differences between the characters involved. No significant relationship between seed yield and the various stability parameters was found, but between variance (v), b (regression coefficient) and S^2 d (deviation from the regression) of these parameters highly significant relationships were found. However, significant positive correlations between stability parameters for seed yield and some parameters of 1000-seed weight were detected. A high stability for yield components such as 1000-seed weight and maturity should be considered when breeding for yield stability in faba beans.

Introduction

Faba bean is an adapted seed legume with high yield capacity in Europe (Dantuma *et al.* 1983). In different environments, the stability of yield and other characters plays an important role in plant breeding programs.

For traits such as yield, the relative performance of genotypes can vary from one environment to another. Therefore, it is important to have an objective measure of the main reasons for the yield differences caused by genotype x environment interactions.

Reliable methods for estimating stability parameters are important in effective selection for improved stability of several characters. Different methods have been proposed to find "indices" which could estimate this stability. Some of them are based on analysis of variance and others use regression analysis.

Yates and Cochran (1938) were the first to point out that for the regression of yield, an environmental index can be used to measure stability. Later, Finlay and Wilkinson (1963) and Eberhart and Russell (1966) developed and modified this method. Sprague and Federer (1951), Plaisted and Peterson (1959), and Comstock and Moll (1963) developed the analysis of variance approach to estimate genotype x environment interactions, while Wricke (1962; 1964) proposed the term "ecovalence" as a measure of the stability of characters in different environments.

Although there are numerous papers on stability estimations for different field crops, only a few are available for faba beans. For further adaptation of faba beans to different environments more investigations are needed.

The purpose of this paper was to find out whether several stability parameters for yield and other important characters are related to yield performance *per se* or the yield components. If relationships between high yield stability parameters and other characters exist, indirect selection for high yield stability could be possible in *faba beans*.

Materials and Methods

The data from several joint faba bean trials using eight different varieties, Dacre, Maris Bead, and Blaze from UK; Herra and Kristall from West Germany; and Felix, Minica, and Wierboon C.B. from the Netherlands were used in this investigation. The nine experiments were grown in completely randomized block designs with three replications at three locations (Cambridge and Aberystwyth in UK and Dijon in France) in three successive seasons, 1977, 1978, and 1979. The plant density was 40 plants/m^2 and the plot size 20 m^2. An environment is defined as one year/location combination.

The locations had very different temperatures, rainfalls, and photoperiods. Seed yield (100 kg/ha, at 86% dry matter), 1000-seed weight (g), protein content

(%), and maturity (days from 1 January) were recorded. To characterize the phenotypic stability quantitatively for these characters, we computed the following four stability parameters:

(i) b = linear regression coefficient (Eberhart and Russell 1966),

(ii) s^2 = mean square of deviation from regression (Eberhart and Russell 1966),

(iii) V = variance of each variety (over all environments), and

(iv) W = ecovalence (Wricke 1962).

Results

The results of the stability analysis of variance are summarized in Table 1. The effects of environments (E), varieties (V), and varieties x environments (V x E) interactions were highly significant for all four characters. Further partitioning of this sum of the variance V x E into linear and non-linear components indicated differences between the different characters. For 1000-seed weight and protein, there was a significant linear genotype x environment interaction, indicating that the genotypes react differently in their linear response to a change of environments. On the other hand, there was a significant non-linear regression for all characters suggesting that for seed yield and maturity of the eight varieties, the relatively unpredictable component of the genotype x environment interaction is of greater importance than the relatively predictable component computed.

The values for the stability parameters of the eight varieties differed in the rank order for most stability parameters (Table 2). Looking at these four

Table 1. Stability analysis of variance of eight faba bean varieties.

Source of variance	DF	Mean square: Seed yield 100 kg/ha	1000-seed weight (g)	Protein content (%)	Maturity (days)
Environments (E)	8	1545.83**	147720.33**	31.20**	6200.94**
Varieties (V)	7	531.66**	3025655.80**	26.35**	773.64**
V x E	56	59.15**	17525.28**	3.31**	29.67**
Hetr. Regr. Varieties (linear)	7	73.53	44719.20**	11.20**	45.47**
Deviation from regression (non-linear)	49	57.09**	13640.43**	2.18**	27.41**
Error	126	19.48	1313.65	0.81	2.02

**Significant at P = 0.01.

Table 2. Stability parameters for seed yield over nine environments.

Varieties	Mean	Rank	Regression coefficient	Rank	Sum of squared deviation from regression	Rank	Variance	Rank	Ecovalence	Rank
Dacre	44.50	5	0.68	7	13.01	6	41.47	1	17.84	6
Maris Bead	40.80	8	0.86	5	3.17	1	49.95	2	4.11	1
Blaze	44.70	4	0.89	3	12.58	5	61.45	4	11.86	5
Herra	43.60	7	0.98	1	6.70	4	67.47	5	5.90	2
Kristall	44.30	6	0.91	2	6.25	2	58.50	3	6.03	3
Felix	50.50	2	1.23	6	55.83	8	146.72	8	52.34	8
Minica	54.80	1	1.11	4	6.70	3	84.51	6	6.57	4
Wierboon-C.B.	47.40	3	1.35	8	28.97	7	143.22	7	33.36	7

Stability parameters simultaneously, we found that some results give similar rank orders. For example, by comparing the sum of squared deviations from the regression and ecovalence, the variety Maris Bead shows low yield and high stability but Minica shows high average yields but moderate to low stability parameters.

In this study, there was no significant relationship between seed yield and the various stability parameters (Table 3). However, there were highly significant positive relationships between the variance (v) and b (r=0.95) and Sd (r=0.85) for seed yield. Also, there were highly significant positive correlations between S^2 d, V, and W.

Table 3. Simple correlation coefficients between mean yield (x) and stability parameters for seed yield.

Stability parameters	b	S^2 d	V	W
Mean (x)	0.60	0.41	0.57	0.39
b		0.63	0.95**	0.62
S^2 d			0.85**	0.99**
V				0.85**

** Significant at P = 0.01.

Table 4 shows the simple correlation coefficients between stability parameters for seed yield and those for 1000-seed weight, protein content, and maturity. There were significant positive correlations between stability parameters for seed yield and some parameters such as S^2 d, V, and W for 1000-seed weight, suggesting that the stability for 1000-seed weight was crucial to yield stability. However, stability for maturity was important for yield stability, as indicated by significant correlations between W for seed yield and b and V for maturity, and between S^2 d for seed yield and b for maturity.

Discussion

These studies confirmed the existence of highly significant interactions between varieties and environments in faba beans. This is in accordance with the findings of Dantuma *et al.* (1983) and Yassin (1973).

Our results on stability parameters and their correlations differ from some other authors, probably because our material covers only a small number of genotypes and a limited number of environments. However, the correlations between these various stability parameters are similar to the results of Wricke (1964), Langer *et al.* (1978), and Becker (1981).

Stability for yield components contributes to yield stability but we could not determine the relationships between the seed yield stability parameter (S^2 d) and 1000-seed weight, protein content, and maturity (Table 5).

In grain crops, the development of yield components is a series of sequential events, so stress due to environmental factors at any stage may affect final yield. The effects of stress on yield may vary from one genotype to another depending on the length of

Table 5. Simple correlation coefficients between yield stability parameter (S^2 d) and other characters.

Yield stability parameter	1000-seed weight (g)	Protein content (%)	Maturity (days)
S^2 d	0.70	-0.64	-0.65

Table 4. Simple correlation coefficients between stability parameters for yield and stability parameters for *1000-seed weight*, protein content, and maturity.

Yield parameter	1000-seed weight parameter				Protein content parameter				Maturity parameter			
	b	S^2 d	V	W	b	S^2 d	V	W	b	S^2 d	V	W
b	0.80*	0.57	0.91**	0.78**	0.19	0.01	-0.35	-0.11	0.31	-0.18	-0.59	-0.19
S^2 d	-0.10	0.98**	0.86**	0.97**	0.36	0.36	-0.13	0.25	0.82*	0.29	0.58	0.27
V	-0.49	0.86**	0.93**	0.88**	0.38	0.60	0.81*	0.43	-0.01	0.07	0.23	0.09
W	-0.12	0.96**	0.83**	0.94**	0.60	0.78*	0.90**	0.71*	0.87**	0.48	0.81*	0.46

* and ** significant at P = 0.05 and 0.01, respectively.

growing period and the growth stage in which the stress occurs. Heinrich *et al.* (1982) reported that seed weight maintenance under stress makes an important contribution to yield stability in grain sorghum. Our results with faba bean varieties agree with these results.

We recommend that more attention should be paid to stability for yield components, such as 1000-seed weight, and stability of maturity data in breeding stable genotypes of faba beans.

Acknowledgement

We are very grateful to Dr. E. von Kittlitz, Landessaatzuchtanstalt, University of Hohenheim, for letting us use the extensive data of the Joint Faba Bean Trials 1977-1979.

References

Becker, H.C. 1981. Correlations among some statistical measures of phenotypic stability. Euphytica 30: 835-840.

Comstock, R.E. and Moll, R.H. 1963. Genotype-environment interactions. Symp. on Stat. Genetics and Plant Breeding, NAS-NRC pub. 982: 164-196.

Dantuma, D., von Kittlitz, E., Frauen, M. and Bond, D.A. 1983. Yield, yield stability and measurements of morphological and phenological characters of faba bean (*Vicia faba* L.) varieties grown in a wide range of environments in Western Europe. Zeitschrift fuer Pflanzenzuechtung 90: 85-105.

Eberhart, S.A and Russell, W.A. 1966. Stability parameters for comparing varieties. Crop Science 6: 36-40.

Finlay, K.W. and Wilkinson, G.N. 1963. The analysis of adaptation in a plant breeding program. Australian Journal of Agricultural Research 14: 741-754.

Heinrich, G.M., Francis, C.A. and Eastin, J.D. 1983. Stability of grain sorghum (*Sorghum bicolor* (L) Moench) yield components across diverse environments. Crop Science 23: 209-212.

Langer, I., Frey, K.J. and Bailey, T.B. 1978. Production response and stability characteristics of oat cultivars developed in different areas. Crop Science 18: 938-942.

Plaisted, R.L. and Peterson, L.C. 1959. A technique for evaluating the ability of selections to yield consistently in different locations or seasons. A. Potato Journal 36: 381-385.

Sprague, G.F. and Federer, W.T. 1951. A comparison of variance components in corn yield trials: II. Error, year x variety, location x variety and variety components. Agronomy Journal 43: 535-541.

Wricke, G. 1962. Uber eine Methode zur Fassung der okologischen Streubreite in Feldversuchen. Zeitschrift fuer Pflanzenzuechtung 47: 92-96.

Wricke, G. 1964. Zur Berechnung der Okovalenz bei Sommerweizen und Hafer Zeitschrift fuer Pflanzenzuechtung 52: 127-138.

Yassin, T.E. 1973. Analysis of yield stability in field beans (*Vicia faba* L.) in the northern province of the Sudan. Journal of Agricultural Science, Cambridge 80: 119-124.

Yates, F. and Cochran, W.G. 1938. The analysis of groups of experiments. Journal of Agricultural Science, Cambridge 28: 556-580.

معايير استقرار الصفات الهامة في مختلف طرز الفول

ملخص :

اجريت دراسة على استقرار الغلة عند ثمانية أصناف من الفول (Vicia faba L.) تحت تسع بيئات في بريطانيا وفرنسا . وقد صنفت الاصناف حسب حجم البذرة الى مجموعتين مجموعة صغيرة الحبة (Maris Bead و Blaze و Dacre و Kristall و Herra) ومجموعة كبيرة الحبة (Felix و Minica و Wierboom C.B.) وكانت المجموعتان تختلفان في طول النبات وشكل القرون والتبكير في النضج . وقد حللت جميع هذه الاصناف لمعرفة مدى ثباتها . كما حدد الارتباط البسيط بين معايير الاستقرار بالنسبة للغلة ومكوناتها وبعض الصفات الاخرى . وتم حساب التأثير المتبادل بين الصنف x البيئة بالنسبة للغلة الحبية وغيرها من الصفات . ان التباين في المكونات الخطية وغير الخطية للتأثير المتبادل بين الصنف والبيئة يشير الى وجود فروقات معنوية بين الصفات المدروسة . هذا ولم تظهر اية علاقة معنوية بين الغلة الحبية ومعايير الاستقرار المختلفة ، ولكنه وجدت علاقات معنوية شديدة بين قيم التباين (V) ومعامل الانحدار (b) والانحراف عن الانحدار (S^2d) الخاصة بهذه المعايير . ومع ذلك فقد ظهر وجود ارتباطات موجبة ومعنوية بين معايير الاستقرار للغلة الحبية وبعض المعايير كوزن الالف حبة ، ان الاستقرار العالي لمكونات الغلة مثل وزن الـ 1000 وموعد النضج يجب اخذهما بعين الاعتبار عند التربية لاستقرار الغلة في محصول الفول .

Physiology and Microbiology

Effects of Biological Nitrogen Fixation by Faba Beans (Vicia faba L.) on the Nitrogen Economy of the Soil

R. Huber, E.R. Keller and F. Schwendimann
Department of Crop Sciences,
Swiss Federal Institute of Technology,
CH-8092, Zurich,
SWITZERLAND

Abstract

The effect of nitrogen fixation by faba beans (Minica and Herz-Freya) on the nitrogen economy of the soil was investigated in a transportable container installation at the experimental station of the Department of Crop Science of the ETH, Zurich. The results were compared with those of parallel field trials and the utilisation of the remaining nitrogen in the residues of the faba beans by winter wheat, cultivated after harvesting the faba beans, was determined by ^{15}N labelling. The faba beans fixed an average of 80% of their nitrogen requirements from the air. The nitrogen turnover was increased by replacing corn for silage by faba beans in the rotation but the absolute nitrogen content of the soil was not affected. The extent of the secondary effects of nitrogen remaining in the soil after the faba bean crop on the next crop of winter wheat was dependent on factors at the site as well as climatic conditions during the winter months. Utilisation of the remaining nitrogen in the crop residues was minimal (3-5%).

Introduction

No clear statements can be found in current literature about the extent of biological nitrogen fixation (BNF) of faba beans and its influence on the nitrogen economy of the soil. Values of from 150 kg N/ha/year (Jensen 1986) have been reported but the amount of nitrogen losses due to leaching has not been investigated to any great extent.

More information is available on the effects of crop rotation (Dyke and Slope 1978; Stuelpnagel and Scheffer 1983). The actual secondary effects of nitrogen have never been investigated, in contrast to the total effects of all factors such as secondary effects of nitrogen, repression of disease, improvement of structure, etc. In most studies, only a small part of the nitrogen economy (e.g. only biological nitrogen fixation or leaching of nitrogen) was investigated. An overall consideration of the nitrogen economy in relation to biological nitrogen fixation has rarely been undertaken.

The following study aimed to investigate the overall effect of a faba bean crop on the nitrogen economy of the soil. A transportable model container installation was developed that enabled the measurement of all additions of nitrogen to the soil, as well as nitrogen loss especially due to leaching. Parallel field trials were conducted to check the results. A trial was also conducted with small containers and harvest residues labelled with ^{15}N to estimate the utilisation of residues by the next crop of winter wheat following the harvest of faba beans.

Materials and Methods

Investigation in the model container installation (CMI)

The model container installation, which has been developed over several years in the Department of Crop Science (Keller *et al.* 1987), consisted of 48 large containers (volume = 0.8 m^3; area = 0.8 m^2) (Fig. 1). Three crop rotations (A, B, C), with an increasing portion of faba beans, were cultivated in the CMI:

A = corn for silage-winter wheat/rape seed-corn for silage-summer wheat,
B = faba beans-winter wheat/rape seed-corn for silage-summer wheat/rape seed, and
C = faba beans-winter wheat/rape seed-faba beans-summer wheat/rape seed.

During 1985 and 1986, all additions to and losses of nitrogen (with the exception of denitrification) from the soil were measured progressively, with the extent of biological nitrogen fixation by faba beans being determined by the ^{15}N method (McAuliffe *et al.* 1958; Fried and Broeshart 1975). The content of plant available nitrogen in the soil was determined periodically using the N_{min} method according to Scharpf

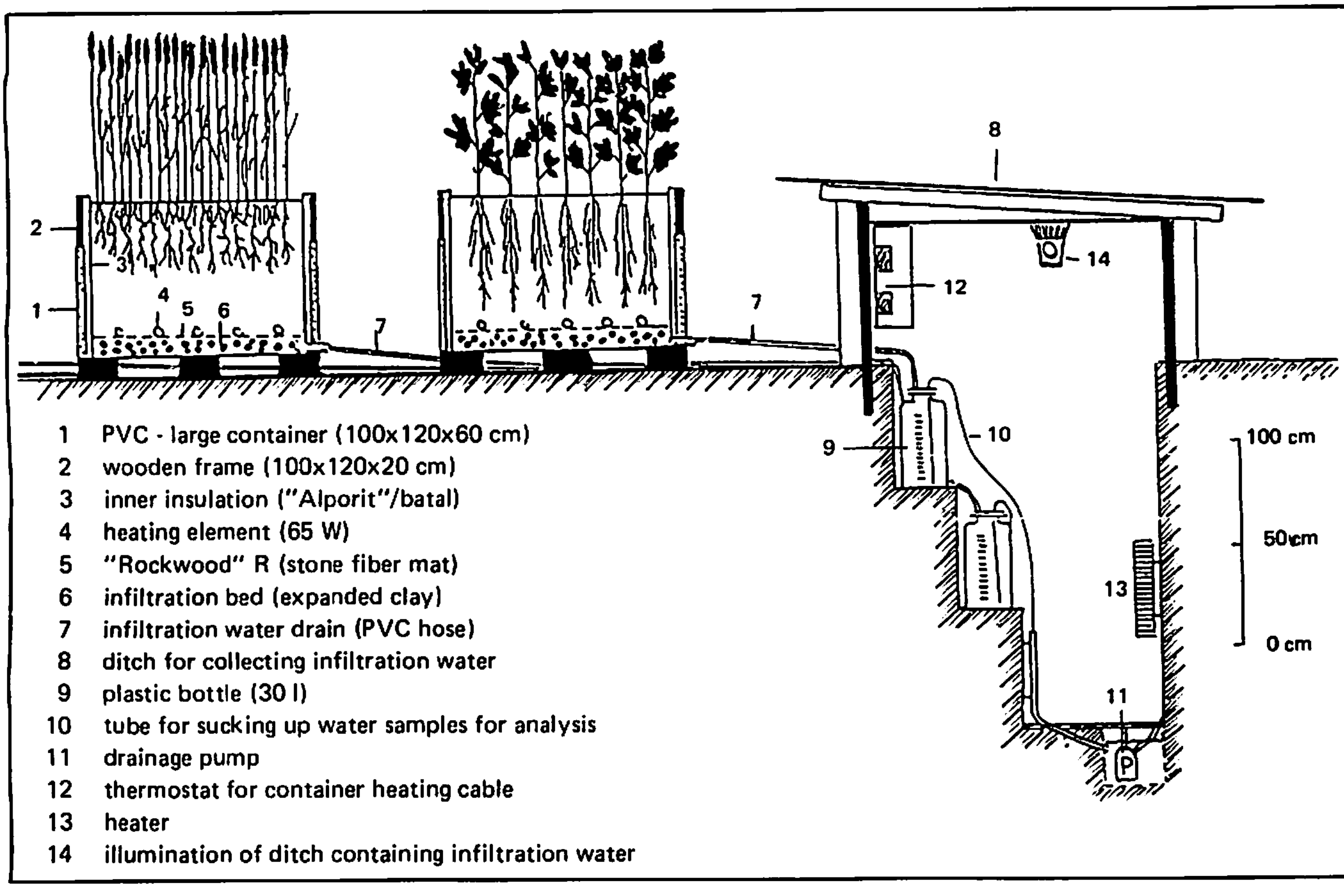

Fig. 1. Cross section of a container installation in Eschikon (scale 1:25)

(1977). The effects of the faba bean residues on the next crop of winter wheat were compared with the effect of corn for silage in a crop rotation.

Parallel field trials to check the CMI results

A small-plot (plot area = 4 m^2) trial was conducted in 1986 to determine the biological nitrogen fixation of faba beans using the ^{15}N method under field conditions. In the same year, the results of the CMI trial were checked on nine farms. The following parameters were measured: course of the N_{min} content in the soil (under winter wheat) from the harvest of the previous crop (faba beans, corn, or potatoes) up until the harvest of the winter wheat, nitrogen supply to winter wheat (nitrate rapid test according to Wollring (1983)), and yield components of wheat.

Trial in small containers with ^{15}N labelled harvest residues of faba beans

Faba beans labelled with ^{15}N were grown in a glasshouse during the summer of 1985. The grains were harvested and the shoots and roots chopped and mixed into the soil in various amounts. After the winter wheat had been sown, the small containers (volume = 20 liters) were buried in the ground up to the upper rim (protection from freezing). The wheat was harvested in August 1986 and the dry matter yield and nitrogen and ^{15}N contents were determined. These values provided the basis for determining the amount of nitrogen that was transferred from the faba bean residues to the winter wheat.

Results and Discussion

Investigations in the CMI

The amount of nitrogen fixed by the faba beans was on average 80%, for a yield of about 5000 kg/ha, i.e., four fifths (about 300 kg/ha) of the nitrogen found in the faba beans had been taken up from the atmosphere. This result corresponds well with the values found by Hill-Cottingham and Lloyd-Jones (1980) and Fried *et al.* (1983). The amount of nitrogen transferred from the soil to the grains was between 250 and 300 kg/ha. This value depends greatly on the size of the yield and extent of harvest losses.

Nitrogen leaching, which occurred during crop growth and following harvest, was greater than for corn for silage and wheat (Fig. 4). Whereas nitrogen leaching under corn for silage occurred for the most part during spring, large amounts of N in the faba bean plots were lost during late autumn, i.e., following harvest (Fig. 2). Compared with winter fallow, nitrogen leaching under winter wheat was only slightly reduced (by 10 to 20 kg N/ha) by the end of the year.

Following harvest of the crops in autumn, the N_{min} content after a faba bean crop was as much as 50 kg N/ha higher than after corn for silage. By the following spring, however, these values were the same (Figs. 3a and 3b). This is a further indication that after a faba bean crop a large portion of remaining plant-available nitrogen is either stored in deeper soil layers or leached into the groundwater during the winter months and so the developing crop is not able to make full use of it.

Fig. 4 shows the nitrogen balance of the crops grown in the CMI. Biological nitrogen fixation results in a great addition of nitrogen but there are large losses due to grain harvest and to leaching. This indicates that while the nitrogen turnover is increased by the cultivation of faba beans, the absolute nitrogen content of the soil is not increased.

Despite almost identical N_{min} contents in spring, wheat sown after faba beans had a markedly better growth habit than wheat following corn for silage. The differences in yield, however, were significant only in the first of the two experimental years (Figs. 5a and 5b). The effect of faba beans on the next crop in the rotation appears to be very dependent on climatic conditions during the winter months. Interestingly, summer wheat shows a stronger

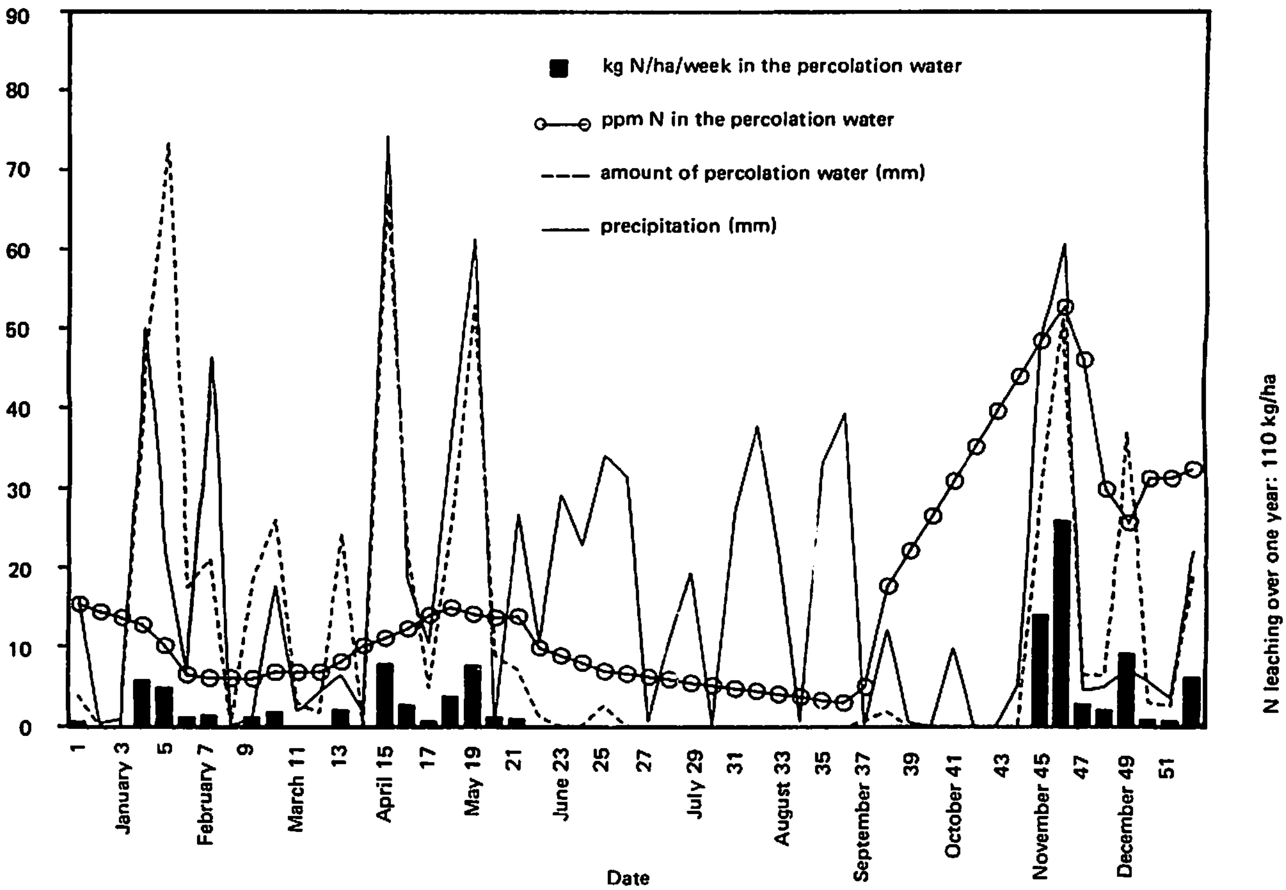

Fig. 2. Weekly measurements of N leaching, N concentration of the percolation water, amounts of percolation water, and precipitation during the cultivation of faba beans / winter wheat (1985).

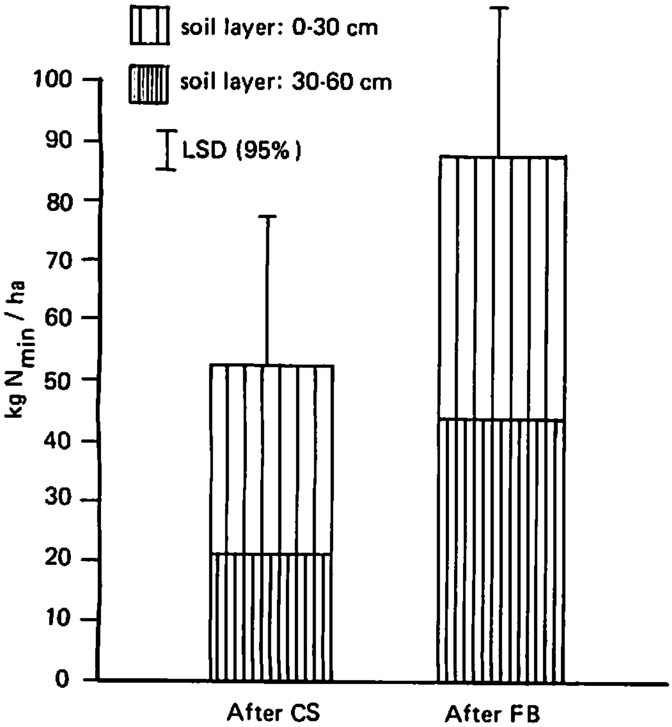

Fig. 3a. N_{min} contents following corn for silage (CS) and faba beans (FB) in autumn 1985.

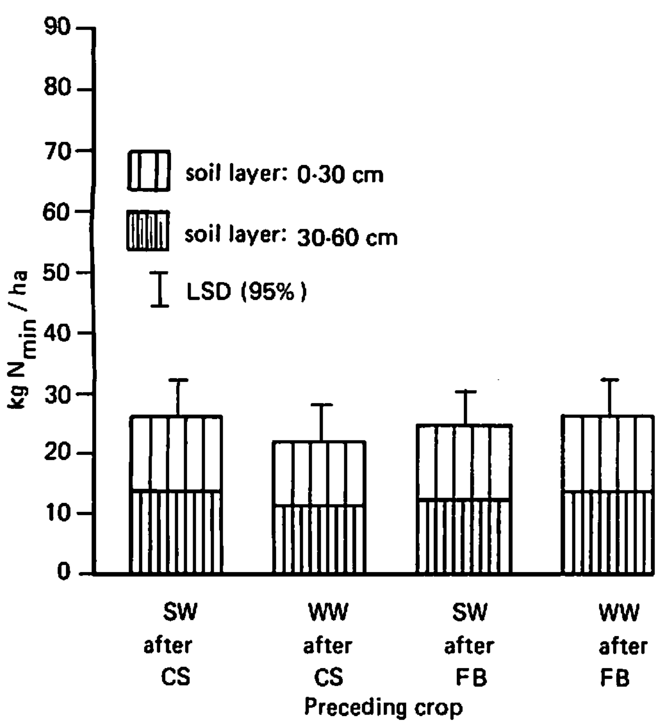

Fig. 3b. N_{min} contents in summer wheat (SW) and winter wheat (WW) depending on the preceding crop (CS=corn for silage; FB=faba beans); spring 1986.

reaction to a preceding crop of faba beans than does winter wheat. This may be due to the fact that the higher content of nitrogen in the soil following winter fallow (preceding the cultivation of summer wheat) allows for a more intensive mineralization of faba bean residues ("Priming Effect" Jenkinson 1985).

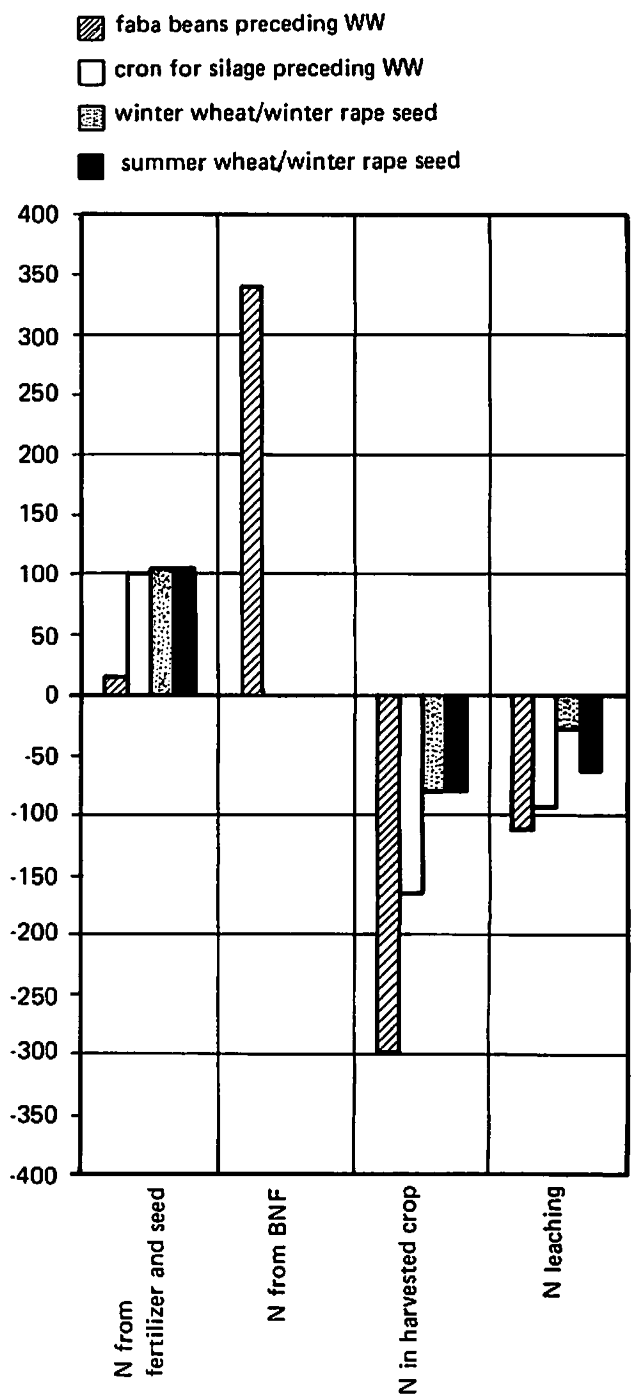

Fig. 4. N balances for faba beans, corn for silage, winter wheat, and summer wheat (1985).

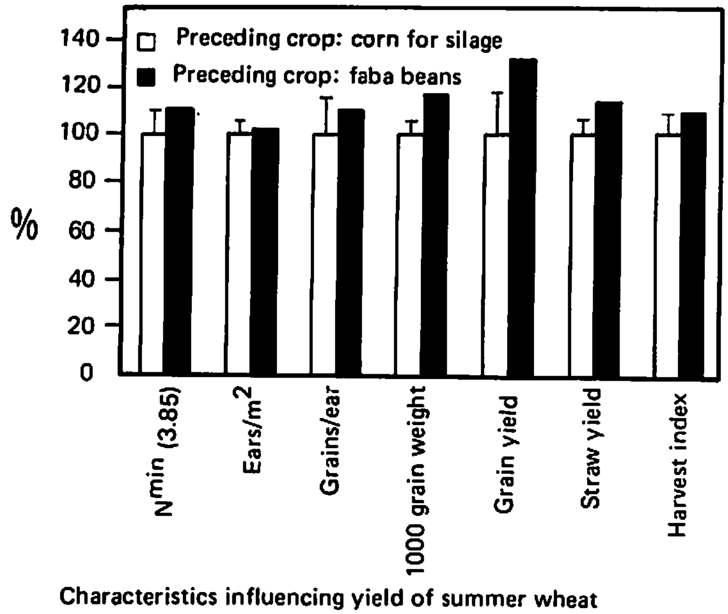

Fig. 5a. Comparison (%) of the effects of preceding crops of faba beans and corn for silage on the yield development of the next crop of summer wheat (model container installation; location: Eschikon; 1985).

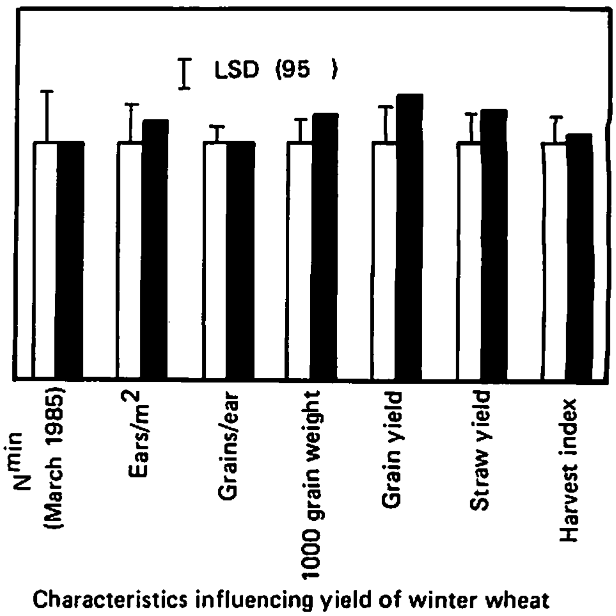

Fig. 5b. Comparison (%) of the effects of preceding crops of faba beans and corn for silage on the yield development of the next crop of winter wheat (model container installation; location: Eschikon; 1985).

Field trials

Biological nitrogen fixation under field conditions was approximately the same as in the container installation (80%). The extent of nitrogen fixation was affected neither by variety (Minica or Herz-Freya) nor by plant density (40 or 60 plants/m^2).

The N_{min} content of the soil was higher after a crop of faba beans than after corn for silage, both in the CMI and in the field. This value was, however, lower than for potatoes.

Plant-available nitrogen was stored in deeper layers of the soil during the winter months (Fig. 6) which suggests that nitrogen may be leached into the groundwater. The N_{min} contents following the three preceding crops were practically identical by the following spring.

The measurements with the nitrate rapid test, however, indicated an increased supply of nitrogen to winter wheat following a faba bean crop.

Small container trial with harvest residues of faba beans labelled with ^{15}N

Only 3-5% of the available nitrogen in the faba bean residues was transferred to the following crop of winter wheat. This was unchanged even when the harvest residue was doubled from 100 kg N/ha to 200 kg N/ha.

Improving the soil structure by plowing in the harvest residue had a positive effect on wheat yield. The poor utilisation of the available nitrogen in the harvest residues could be explained by a high C:N ratio (a high percentage of N is transported from the vegetative plant parts to the grains during ripening of faba beans).

Conclusions

1. Faba beans take about 80% of their required nitrogen from the atmosphere. This means about 300 kg N/ha/year for a yield of 5000 kg/ha.

2. Cultivation of faba beans instead of non-leguminous crops increases nitrogen turnover but not necessarily in the total nitrogen content of the soil.

3. Faba beans can affect the nitrogen supply of the next crop in a rotation in a number of ways (in decreasing order):

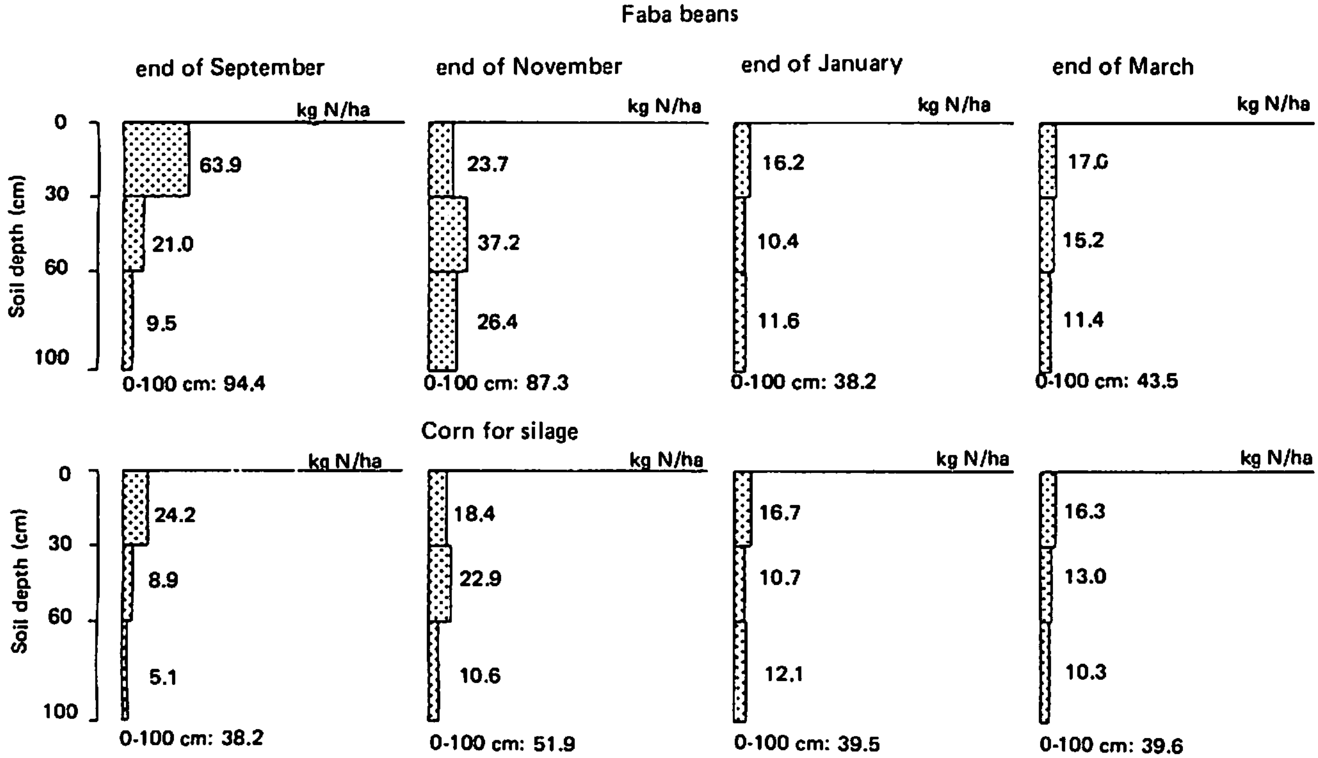

Fig. 6. N_{min} contents (kg N/ha) in various layers of the soil following a crop of faba beans and corn for silage, respectively, during winter 1985/86; location Gerlisberg.

a) No utilisation of mineralised and accumulated nitrogen in the soil during vegetative growth. Nitrogen left over after the faba bean harvest can be utilised only if the following crop is one requiring an early and large supply of nitrogen. Should this not be the case, then the nitrogen is stored in deeper layers of the soil or is leached into the groundwater.
b) Supply of easily mineralisable plant material (prematurely lost plant material, grain loss during harvest).
c) Promotion of mineralisation by improving soil structure.
d) Harvest residues containing nitrogen. The next crop however can profit from this source of nitrogen only to a limited extent (utilisation during the first year: about 3-5 %).

4. Ways must be found to reduce the leaching of nitrogen under middle European climatic conditions following a crop of faba beans, and to improve the nitrogen utilisation of the next crop in the rotation. This could occur under our climatic conditions e.g. by sowing cold tolerant crops which develop quickly, immediately after the faba bean crop.

References

Dyke, G.V. and Slope, D.B. 1978. Effects of previous legume and oat crops on grain yield and take-all in spring barley. Journal of Agricultural Science, Cambridge 91: 443-451.

Fried, M. and Broeshart, H. 1975. An independent measurement of the amount of nitrogen fixed by a legume crop. Plant and Soil 43: 707-711.

Fried, M., Danso, S.K.A. and Zapata, F. 1983. The methodology of measurement of N_2 fixation by nonlegumes as inferred from field experiments with legumes. Canadian Journal of Microbiology 29: 1053-1062.

Hill-Cottingham, D.G. and Lloyd-Jones, C.P. 1980. The influence of nitrate supply on nitrogen fixation during growth of the field bean *Vicia faba* in sand. Physiologia Plantarum 48: 116-120.

Jenkinson, D.S. 1985. Interactions between fertilizer nitrogen and soil nitrogen - the so-called "priming" effect. Journal of Soil Science 36: 425-444.

Jensen, E.S. 1986. Symbiotic N_2-fixation in pea and field bean estimated by ^{15}N fertilizer dilution in field experiments with barley as a reference crop. Plant and Soil 92: 3-13.

Keller, E.R., Huber, R., Schwendimann, F. and Soldati, A. 1987. Containers for small-plot trials with crop plants. Zeitschrift fuer Acker und Pflanzenbau, (In press.)

McAuliffe, C., Chamblee, D.S., Uribe-Arango, H. and Woodhouse, W.W. 1958. Influence of inorganic nitrogen on nitrogen fixation by legumes as revealed by ^{15}N. Agronomy Journal 50: 334-337.

Scharpf, H.C. 1977. Der Mineralstoffgehalt des Bodens als Massstab fur den Stickstoffdungerbedarf. Diss. Univ. Hannover.

Sprent, J.I. and Bradford, A.M. 1977. Nitrogen fixation in field beans (*Vicia faba*) as affected by population density, shading and its relationship with soil moisture. Journal of Agricultural Science, Cambridge 88: 303-310.

Stuelpnagel, R. and Scheffer, K. 1983. Zur N-Nachwirkung der Ackerbohnen (*Vicia faba* L.) in einem Fruchtfolgeversuch mit differenzierter Stickstoffdungung. Landwirtschaftliche Forschung 36: 27-35.

Wollring, J. 1983. Der Nitratgehalt in der Halmbasis als Massstab fur den Stickstoffdungerbedarf bei Wintergetreide. Diss. Univ. Hannover.

تأثيرات تثبيت الازوت العضوي بواسطة الفول (Vicia faba)
على توفير الازوت في التربة

ملخص :

درس تأثير تثبيت الازوت بواسطة صنفي الفول (Minica and Herz-Freya) على توفير الازوت في التربة ضمن حاويات متنقلة في محطة التجارب لدى قسم علوم المحاصيل التابع لـ ETH في زيوريخ . كما قورنت النتائج مع نتائج تجارب حقلية مماثلة . ان استغلال الازوت المتبقي عن الفول من قبل القمح الشتوي المزروع بعد حصاد الفول قد حددت باستعمال النظير الرقمي N 15 . وثبت أن الفول يثبت 80 % بالمتوسط من احتياجاته الازوتية من الجو . وقد ازدادت الاستفادة من تحول الازوت turnover باستبدال الذرة الصفراء للسيلاج بالفول في الدورة الزراعية مع أن المحتوى الازوتي المطلق للتربة لم يتأثر . أن الازوت المتبقي في التربة بعد حصاد محصول الفول وتأثيراته الثانوية على المحصول التالي القمح الشتوي تتوقف على عوامل تتعلق في الموقع نفسه وعلى الظروف الجوية السائدة خلال أشهر الشتاء . أما الاستفادة من الازوت المتبقي عن بقايا المحصول فكانت في حدودها الدنيا (3-5 %) .

Defoliation Studies in Faba Bean

S.P. Singh, N.P. Singh and R.K. Pandey
Department of Agronomy,
G.B. Pant University of Agriculture and Technology,
Pantnagar Nainital-263 145, U.P., INDIA

Abstract

The effects of defoliation on seed yield and its components in faba bean were investigated by removing all leaves, some leaves from different plant parts, and topping of plants. Undefoliated crop had significantly higher seed yield than all defoliated treatments. The number of pods/plant decreased consistently with increasing defoliation. Defoliation of the shoot apex at 90, 105, and 120 days after sowing did not influence seed yield as much as yield attributing characters. Among the treatments involving partial defoliation, removal of leaves from the upper third of the plant resulted in a greater reduction in seed yield compared with leaf removal from the middle third of the plant during both years of the experiment and from the lower third during the first year.

Introduction

The crop canopy is the major plant component intercepting light for photosynthesis. Therefore, any effort to manipulate the plant or population structure to maximize light interception is important.

Removing the functional leaf from a plant results in reduced total dry matter as well as seed production. Hodgson and Blackman (1975) observed that defoliation of the lower part of plants depressed pod development in the upper part. In such studies, the relative importance of the position of leaves needs greater consideration. The evidence suggests that all zones function below their full photosynthetic efficiency when other zones are present (McEwen 1972).

Comprehensive studies under Indian conditions, especially on faba bean, are lacking. The present study was initiated to determine the effects of defoliation on the yield and yield components in faba bean.

Materials and Methods

Three field experiments were conducted under irrigation during the winter season of 1980/81 and 1982/83 on loam and silty clay loam soils at the Crop Research Centre of Govind Ballabh Pant University of Agriculture and Technology, Pantnagar (India). Experiment 1 was designed to study the effects of leaf removal, experiment 2 topping, and experiment 3 removal of leaves from different segments.

Treatments consisted of five intensities of leaf area removal (0, 25, 50, 75, and 100%) in experiment 1, four topping treatments (no topping and topping at 90, 105, and 120 days after sowing) in experiment 2, and five treatments of leaf removal from different zones in the plants (no leaf removal, removal of leaf segments from the lower, middle, and upper third of the plant, and complete leaf removal) in experiment 3. In experiments 1 and 3, plants were defoliated at 90 days after sowing.

A plant population of 500000 plants/ha was maintained in all the experiments by adopting a row spacing of 20 cm with a plant spacing of 10 cm. Variety BS 1 (Bihar selection 1) was planted in the first week of November and harvested in the first week of April in both years. Data on seed yield and yield attributes were recorded.

Results and Discussion

Effect of leaf removal

There were significantly higher seed and biological yields in the undefoliated crop than in all defoliation treatments in both years (Table 1). Per cent reduction in seed yield/ha on a pooled basis was 18, 37, 47 and 62 and by 25, 50, 75, and 100 of leaf defoliation over no defoliation, respectively.

The number of pods/plant decreased consistently with increased defoliation compared to the undefoliated crop. However, there was a significant improvement in the number of seeds/pod under the two intensive defoliation treatments (75 and 100% defoliation) over the undefoliated control during both years. This may be due to fewer immature pods and a larger number of well developed seeds. Defoliation did not affect 100-seed weight or harvest index. McEwen (1972) reported that partial defoliation resulted in decreased yield due to fewer pods but seed size or number of seeds/pod were not markedly influenced.

Effect of topping

Topping of the shoot apex at 90, 105, and 120 days after sowing did not influence seed or biological yield/ha or other yield attributing characters such as number of pods/plant, number of seeds/pod, and 100-seed weight (Table 2). This could be due to negligible differences in leaf area in the topped and control crops. Gehriger *et al.* (1979) reported that the number of pods/plant was as high in decapitated as in control plants.

Effect of leaf segment removal

Seed and biological yields/ha were significantly lower when all the leaves were removed than when none or only some were removed from various zones i.e., lower, middle, and upper third of the plants (Table 3). Among the treatments involving partial defoliation, removal of leaves from the upper third resulted in greater reduction in seed yield than when leaves were removed from the middle third in both years, and the lower third in the first year. Reduced seed yield when a leaf was removed from the upper third could be related to the loss of leaves that are more photosynthetically active than those in other zones. While studying the

Table 1. Effect of defoliation on seed yield and its components.

Leaf area defolia-tion (%)	Seed yield (kg/ha)			Biological yield (kg/ha)		Harvest index (%)		Number of pods/plant		Number of seeds/pod		100 - seed weight (g)	
	1980/81	1982/83	Pooled	1980/81	1982/83	1980/81	1982/83	1980/81	1982/83	1980/81	1982/83	1980/81	1982/83
0	2447	4032	3239	4780	8110	51.1	52.3	10.8	18.4	2.3	2.4	23.6	25.3
25	2225	3078	2651	4315	6030	47.3	51.5	9.3	17.0	2.5	2.5	24.5	25.6
50	1776	2285	2030	3467	4643	50.5	49.9	6.1	13.6	2.3	2.4	24.5	25.7
75	1378	2037	1707	2777	3950	47.5	51.8	5.7	12.6	2.5	2.6	24.8	25.1
100	1228	1248	1238	2410	2490	51.7	51.0	4.9	11.8	2.5	2.6	24.9	25.3
LSD at 0.05	129	235	460	135	121	NS	NS	0.3	1.7	0.1	0.2	NS	NS

NS= not significant.

Table 2. Effect of topping on seed yield and its components.

Topping (days after sowing)	Seed yield (kg/ha)			Biological yield (kg/ha)		Harvest index (%)		Number of pods/plant		Number of seeds/pod		100-seed weight (g)	
	1980/81	1982/83	Pooled	1980/81	1982/83	1980/81	1982/83	1980/81	1982/83	1980/81	1982/83	1980/81	1982/83
Control	2836	4165	3500	8700	9075	33.4	45.8	13.8	15.0	2.5	2.6	25.0	26.0
90	3185	3946	3515	9125	9800	34.0	42.2	13.1	14.6	2.5	2.6	25.8	25.9
105	2915	3865	3390	8725	9475	33.0	40.9	13.7	14.8	2.5	2.6	25.9	26.0
120	3162	3494	3328	8800	8775	34.0	38.9	13.2	14.3	2.5	2.5	25.6	25.3
LSD	NS	NS	NS	NS	NS	NS	4.2	NS	NS	NS	NS	NS	NS

NS= not significant.

Table 3. Effect of leaf segment removal on seed yield and its components.

Segment from which leaves removed	Seed yield (kg/ha)			Biological yield (kg/ha)		Harvest index (%)		Number of pods/plant		Number of seeds/pod		100-seed weight (g)	
	1980/81	1982/83	Pooled	1980/81	1982/83	1980/81	1982/83	1980/81	1982/83	1980/81	1982/83	1980/81	1982/83
Control	3327	3552	3439	6202	6012	53.8	59.2	20.3	17.1	2.5	2.5	26.8	26.1
Lower third	2856	2756	2806	6012	5375	47.3	54.4	15.8	15.7	2.4	2.5	26.1	26.0
Middle third	2508	3205	2856	5997	5437	41.6	59.2	18.5	15.5	2.5	2.5	25.3	25.8
Upper third	2545	2204	2174	5110	3800	39.8	58.6	17.8	11.2	2.5	2.5	27.3	25.9
Complete	1068	1557	1312	3340	2875	31.4	55.3	11.7	11.2	2.4	2.4	26.2	25.1
LSD at 0.05	360	640	171	529	870	4.5	NS	4.8	3.0	NS	NS	NS	NS

NS = not significant.

effect of different levels of defoliation in cowpea, Rafique (1983) observed that the sink was limited by source size.

The magnitude of reduction in number of pods/plant was greater when leaves were removed from the upper third during 1982/83 and with complete leaf removal in both years compared to the other treatments. Defoliation treatments did not affect number of seeds/pod or 100-seed weight. Similar results were also reported by McEwen (1972).

References

Gehriger, W., Bellucci, S. and Keller, E.R. 1979. Influence of decapitation and growth regulators on yield components and yield of *Vicia faba* L. Pages 421-435 *in* Some Current Research on *Vicia faba* in Western Europe (Bond, A., ed.). EEC, FUR 6244 EN Luxembourg.

Hodgson, G.L. and Blackman, G.E. 1957. An analysis of the influence of plant density on the growth of *Vicia faba*. II. The significance of competition for light in relation to plant development at different densities. Journal of Experimental Botany 8 (23): 195-219.

McEwen, J. 1972. Effects of defoliating different zones on the plant in field bean (*Vicia faba* L.). Journal of Agricultural Science, Cambridge 78: 487-490.

Rafique, Uddin, M. 1983. Effects of some defoliation treatment on the yield components in cowpea (*Vigna unguiculata* L. Walp). Legume Research 6(2): 79-82.

دراسات على اسقاط أوراق الفول

ملخص :

اجرى بحث حول تأثير تساقط الاوراق على الغلة الحبية ومكوناتها في الفول ، وذلك بازالة اما جميع الاوراق ، أو ازالة أوراق من مختلف اجزاء النبات ، أو ازالة قمم النبات . والنتيجة أن محصول النباتات التي لم تسقط أوراقها كانت أعلى بدرجة معنوية من تلك التي أسقطت أوراقها . وقد تناقص عدد القرون/النبات طردا مع زيادة تساقط الاوراق . اما ازالة القمة الطرفية لافرع النبات بعد 90 و 105 و 120 يوما من الزراعة فلم تؤثر على غلتها الحبية بقدر ما أثرت على المواصفات المميزة لها . ومن بين معاملات اسقاط الاوراق جزئيا فقد أدت ازالة الاوراق من الثلث العلوي للنبات الى نقص اكبر في الغلة الحبية بالمقارنة مع ازالتها سواء من الثلث الاوسط للنبات في كلتا سنتي التجربة أو من الثلث الاسفل في السنة الاولى .

Agronomy and Mechanization

The Development of a Regression Equation to Predict Seed Yield of Vicia faba var minor Using Parameters Recorded in the Field

Gretel White[1,3], W.R. Williams[2] and P.J. Gates[1]
[1] *Botany Department, Science Site, South Road, Durham, DH1 3LE, UK*
[2] *Computer Centre, Science Site, South Road, Durham, DH1 3LE, UK*
[3] *Current address: Department of Agriculture and Horticulture, University of Nottingham, School of Agriculture, Sutton Bonington, Loughborough, Leics. LE12 5RD, UK*

Abstract

Two faba bean genotypes, Maris Bead and IVSG, were tested in each of four environments (high and low planting density in combination with high and low irrigation) and a regression procedure was followed to produce an equation to correlate yield with certain vegetative and reproductive plant characteristics. The equation was tested on a segregating faba bean population grown at a different site and during a different season. The predicted values for seed yield were close to the actual values recorded (R=0.916, R^2=0.840). These data were then included in the regression procedure to obtain a more generally applicable equation. This is of value in selecting potentially high yielding lines from a segregating population growing under field conditions, enabling early selection of elite lines.

Introduction

The faba bean (*Vicia faba* var *minor*) has declined in popularity since the agricultural depression in the late nineteenth century. This may be attributed to yield instability in different seasons. Meanwhile, cereals have been substantially improved and their high economic returns make them preferable to the high risk involved in faba bean production. Currently, considerable progress is being made by faba bean breeders in improving yield stability, and this may be accelerated through early selection for desirable traits.

Studies investigating the correlation of various vegetative characters and yield components with final yield have been conducted on a number of crops. Such studies on faba beans suggest a correlation between yield and pods/plant, seeds/plant (Abdalla 1976), seed size, pods/node, pods/flower (Cubero and Martin 1981), ratio of mature pods to total pods (Hodgson and Blackman 1956), leaf area (Ishag 1973), and podded nodes/plant (Magyarosi and Sjodin 1976). Yield analysis studies on other crops such as radish (Parkash *et al.* 1983), niger (Joshi and Thombre 1984), soybean (Hazarika *et al.* 1982), linseed (Rao *et al.* 1983), peas (Ashraf *et al.* 1981), and *Phaseolus vulgaris* L. (Adams *et al.* 1978) have revealed similar correlations between anatomical, physiological, or yield component characters, and final yield. The relationships found in these trials have, however, rarely been exploited as a means of selecting for yield in a breeding program.

The aim of this study was to investigate the possibility of identifying reliable yield-predicting characters in faba bean that could be measured under field conditions. The generation of a yield-predicting equation and the possible value of such an equation using experimental data were investigated.

Materials and Methods

Seeds of the two genotypes Maris Bead and IVSG (Independent Vascular Supply type, line G) were sown in plots (3.5 x 1.2 m) in double rows 10cm apart with 30cm centers and four double rows per plot. Adequate peripheral guard plants were present. A randomized block design was used with four replicates (Cochran and Cox 1957).

In irrigated plots, the soil moisture tension was maintained at less than 2.5 kPa. From each plot, 10 plants were sampled from the central 2 x 0.6 m (40 plants per treatment). The total number of plants sampled was 320. Plant height (PH), numbers of leaves (NL), flowers (NF), pods set (PS), and seed bearing pods (SP), and dry weight of seeds were recorded.

Regression analysis was performed using the Statistical Package for the Social Sciences (SPSSX); a stepwise procedure was employed using the raw data. The data were then transformed to the natural logarithms of the original value and the regression procedure repeated, increasing the accuracy still further.

The equations were tested using data collected from a segregating F_3 population of faba beans grown in Durham in 1984. The seeds were sown in rows, but no attempt was made to obtain a specific plant density or soil moisture status. Data obtained from this population were used to test the reliability of the equation previously calculated. The distributions of all records were tested and found to be normal. To obtain a more generally applicable regression equation, the second data set was added to the original data and the regression procedure repeated with a total of 357 data points.

Results

The initial regression performed on the data from the 1983 trial yielded the following regression equation (equation 1).

Predicted WS = (SP x 0.7598)+(PH x 0.1595)+(NL x 0.0950)-3.7596 E-15.

The R^2 value obtained during regression was 0.832. The plot of actual against predicted seed yields was curvilinear (Fig. 1a). When natural logarithms were taken the prediction equation (equation 2) was

LN Predicted WS = (LN SP x 0.8531) + (LN PH x 0.3991)+LN NL x 0.1977)-2.1963.

The R^2 value obtained in the second regression was 0.848, and the plot of actual against predicted seed yield showed a linear relationship (Fig. 1b), the points at the upper end of the prediction range being closer to the regression line than those at the lower end of the scale.

When data from the plant population grown at Durham in 1984 were processed using equation 2, the regression value obtained was 0.916 and the R^2 value was 0.840. This indicates that the equation derived from the data collected in the previous year on a different site and from plants of different genetic background was more accurate in predicting yield. As previously observed, the closest correlation between actual and predicted yields was at the upper end of the range of measurements made (Fig. 2a). Equation 1 gave an accurate prediction of yield at the lower end of the range of recorded data (Fig. 2b).

Modification of the equation using both the initial data set and the 1984 data yielded a slightly different equation (equation 3) that should be more generally applicable for selection for yield in breeding programs.

LN Predicted WS = (LN SP x 0.8630)+(LN PH x 0.4527)+(LN CF x 0.1177)-2.3669.

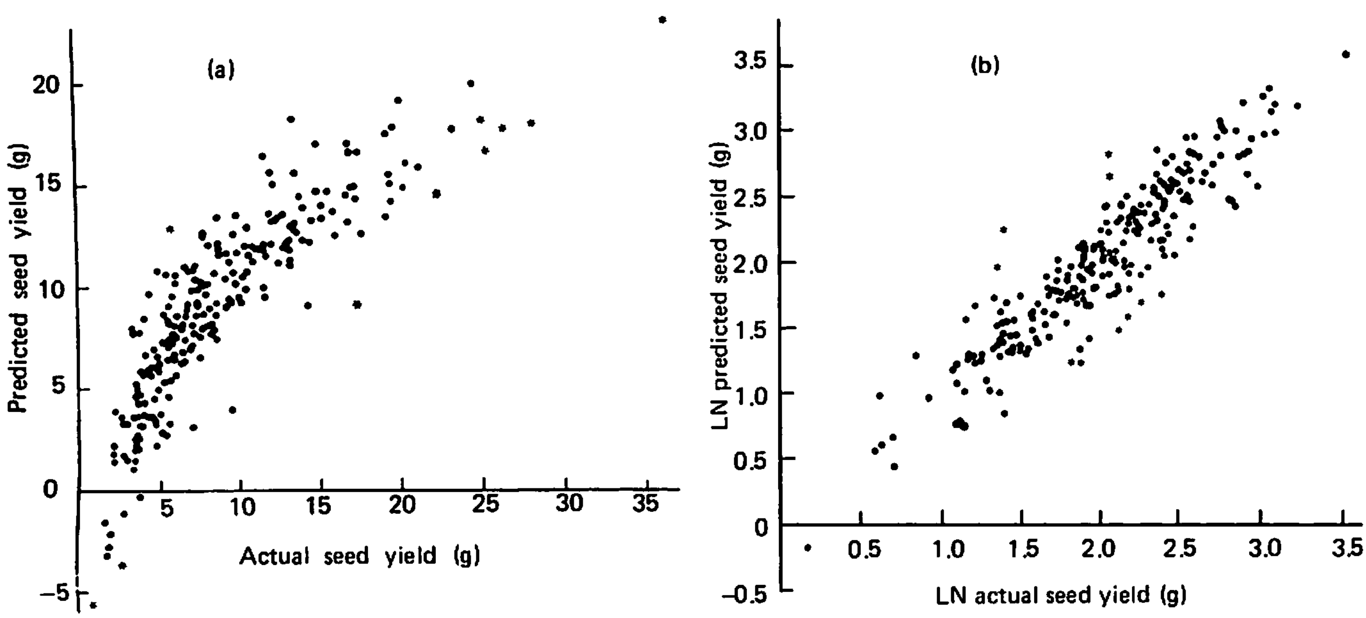

Fig. 1. Actual seed yield plotted against predicted yield using data from the 1983 trial. a) Untransformed data b) LN values. o =values fitting the regression line, * =values outside the range of the confidence interval of the regression line.

The R^2 value obtained from this equation was 0.857. The data points collected were plotted (Fig. 3a), and the prediction was more accurate at the higher seed yields. By repeating the regression and forcing the variables encountered in equation 1 into the procedure, we obtained equation 4.

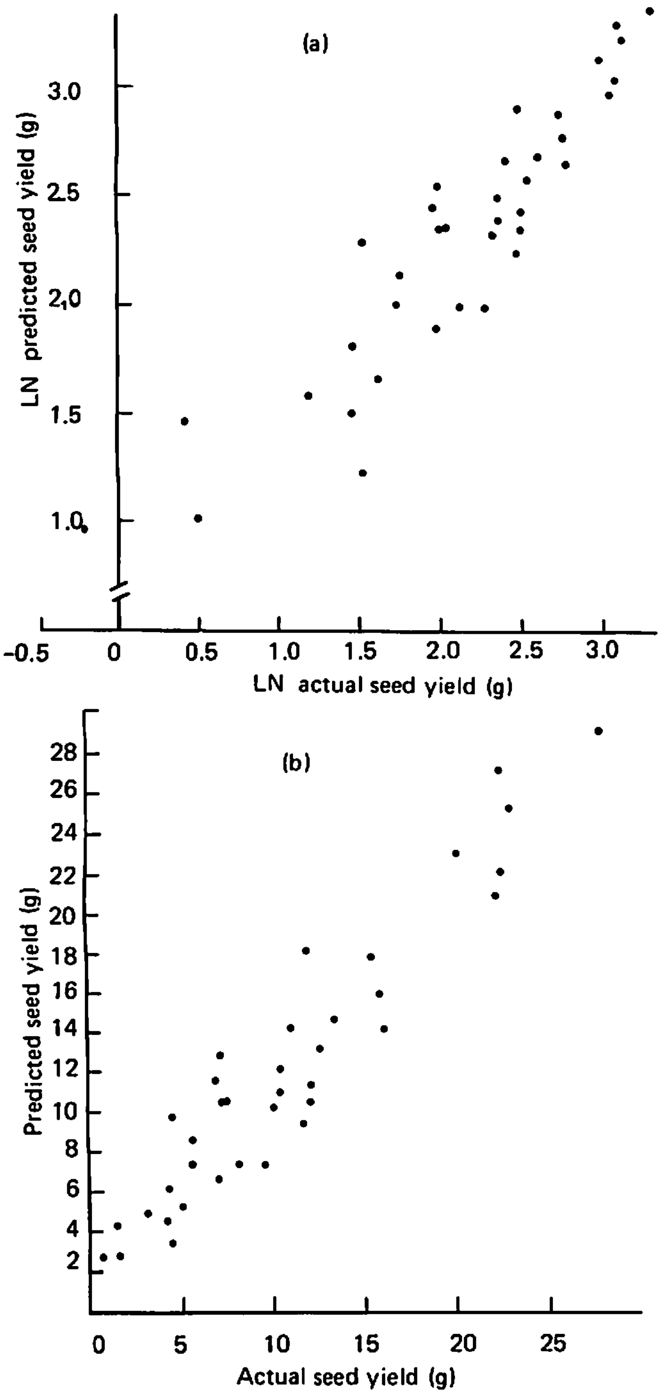

Fig. 2. Plots of the 1984 population data to test the accuracy of the predicting equations a) using equation 2 and b) using equation 1.

Predicted WS = (SP x 0.7601)+(PH x 0.0353)+(NL x 0.1306)-5.0430.

The R^2 value for this regression was 0.826. The plot of this regression analysis showed that there was a spread of points in the upper part of the yield prediction. This would render the equation less accurate in the region where the greatest precision is required (Fig. 3b). To increase the precision of the prediction in that region, we used the natural logarithms for a further analysis and equation 5 was obtained.

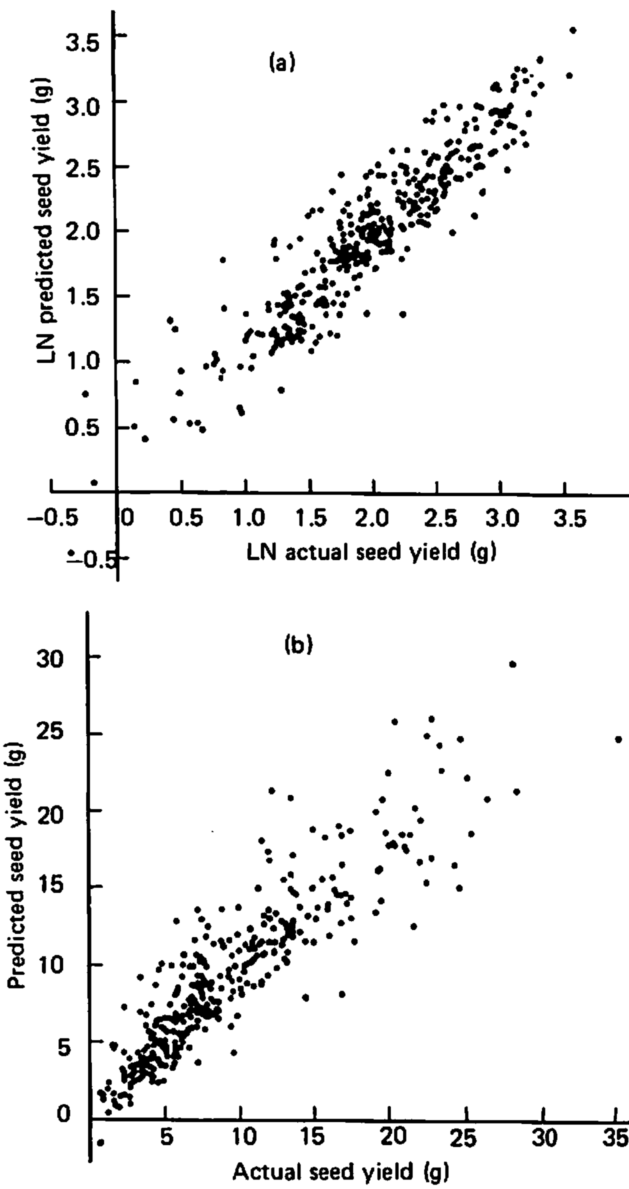

Fig. 3. Plots of the data from the 1983 and 1984 experiments combined. a) Natural logarithms of the actual values and b) untransformed data.

LN Predicted WS = (LN SP x 0.8796)+(LN PH x 0.4546)+(LN NL x 0.1455)-2.4177.

The R^2 value was 0.854. When the plot resulting from equation 5 was examined the accuracy of seed yield prediction was high in the upper part of the prediction range (Fig. 4).

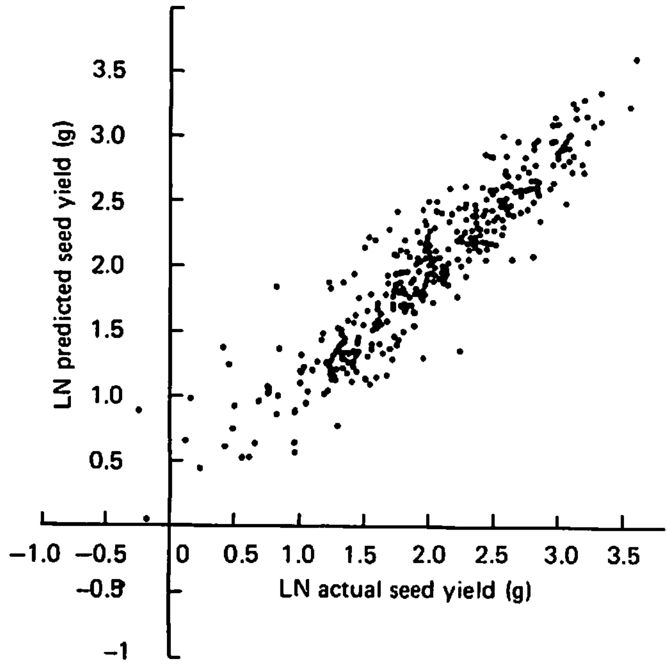

Fig. 4. Plot of combined data from the 1983 and 1984 trials using equation 5, which uses natural logarithms.

Examining the relationship between number of flowers and leaves by means of a Pearson Correlation showed that this was 0.584 and was highly significant.

In a prediction equation, either the number of flowers or the number of leaves may be used and the level of accuracy will not be significantly altered. As the number of leaves produced is easy to count this is the favored parameter for practical use in predicting seed yield.

Discussion

In the field trial conducted at Invergowrie, each of the two genotypes was effectively tested in four environments. The variation may be thought of as testing the faba beans under different cultural regimes. Environmental factors are normally considered to be responsible for the wide variations in yield under field conditions. By using these data to compute a regression equation to predict yield much of the possible variation is taken into account. The R^2 values obtained were very high, suggesting that the variation in yield is closely correlated with other plant characteristics. By taking the variation of those characters into account, yield may be accurately predicted.

The reliability of the equation to predict yield was tested using data collected from a segregating population resulting from a cross made at Durham 2 years previously under different conditions. When the data were put into the equation, the prediction was accurate (Fig. 2a and 2b). The regression value of the recorded seed yield against predicted seed yield was 0.916. This proves that the equation is of value in predicting seed yield not just in one particular year but in a range of environments.

The modification of the equation using both the original data set and that obtained from the Durham population yields an equation for the prediction of seed yield that should be even more widely applicable than the original equation. This is of significance in a selection program as high yielding plants may be identified before harvest and rogueing can be done early in the season, resulting in more efficient use of labor and increased selection efficiency.

A possible further step in the modification of the equation presented here is to carry out further testing in different environments and develop specific equations for specific geographical regions.

References

Abdalla, M.M.F. 1976. Natural variability and selection in some local and exotic populations of field beans (*Vicia faba* L.). Zeitschrift fuer Pflanzenzuchtung 76: 334-343.

Adams, M.W., Wiersma, J.V. and Salazar, J. 1978. Differences in starch accumulation among dry bean cultivars. Crop Science 18: 155-157.

Ashraf, M., Shafi, M.M. and Ahmad, S.N. 1981. Correlation studies on certain morphological and economic characteristics in eight cultivars of peas (*Pisum sativum* L.). Journal of Agricultural Research, Pakistan 19: 175-180.

Cochran, W.G. and Cox, G.M. 1957. Experimental Designs. John Wiley and Sons, New York, USA.

Cubero, J.I. and Martin, A. 1981. Factorial analysis of yield components in *Vicia faba*. Pages 139-151 *in* World Crops: Production, Utilization and

Description. Vol.4, *Vicia faba*: Physiology and Breeding (Thompson, R., ed.).

Hazarika, G.N., Barthakur, A.K. and Singh, S.N. 1982. Character association and path analysis in soybean (*Glycine max*). Journal of Research, Assam Agricultural University 3: 12-14.

Hodgson, G.L. and Blackman, G.E. 1956. An analysis of the influence of plant density on the growth of *Vicia faba*. I. The influence of density on the pattern of development. Journal of Experimental Botany 7: 147-165.

Ishag, H.M. 1973. Physiology of seed yield in field beans (*Vicia faba* L.). II. Dry matter production. Journal of Agricultural Science, Cambridge 80: 191-199.

Joshi, P.B. and Thombre, M.V. 1984. Genotypic correlation coefficients of yield contributing characters in Niger (*Guizotia abyssinica*). Journal of Maharashtra Agricultural Universities 9: 10-12.

Magyarosi, T. and Sjodin, J. 1976. Investigations of yield and yield components in field bean (*Vicia faba* L.) varieties with different ripening time. Zeitschrift fuer Pflanzenzuchtung 77: 133-144.

Parkash, S., Sharma, P.P. and Arya, P.S. 1983. Correlation and regression analysis in radish (*Raphanus sativus*). Indian Journal of Agricultural Research 17: 119-123.

Rao, S.K., Singh, N. and Singh, S.P. 1983. Correlation and regression analysis in linseed (*Linum usitatissimum*). Crop Improvement 10: 45-48.

تطوير معادلة الانحدار للتنبوء عن الغلة الحبية للفول Vicia faba var minor باستعمال معايير مسجلة في الحقل

ملخص :

تم اختبار سلالتين من الفول هما Maris Bead و IVSG تحت أربع بيئات (كثافة نباتية عالية وأخرى منخفضة مع رى كثيف ورى خفيف) ، واتبعت طريقة الانحدار للتوصل الى معادلة تربط الغلة بمواصفات خضرية وتكاثرية معينة . ثم اختبرت تلك المعادلة بتطبيقها على مجاميع فول انعزالية مزروعة في موقع وموسم مختلفين . وكانت قيم الغلة الحبية المقدرة قريبة من القيم الفعلية المسجلة (R= 0.916 ، R^2= 0.840) . ثم ادخلت هذه المعلومات وفق طريقة الانحدار للحصول على معادلة اكثر قابلية على التطبيق عموما . وهذه الطريقة لها اهميتها في انتخاب سلالات ذات كفاءة انتاجية عالية من بين مجاميع انعزالية مزروعة تحت الظروف الحقلية ، مما يساعد على الانتخاب المبكر للسلالات الممتازة elite lines.

Effect of Nitrogen Application and Plant Population per Hill on Faba Bean (Vicia faba) Yield

Farouk Ahmed Salih
Shambat Research Station,
P.O. Box 30, Khartoum North,
SUDAN

Abstract

The effects of three plant densities (16.6, 33.3, and 49.9 plants/m^2) and three levels of applied nitrogen (0, 43, and 86 kg N/ha) on faba bean yield and its components were investigated for two seasons (1984 and 1985) at Shambat Research Station. Nitrogen application had no effect on seed yield/ha in both years and the number of plants/hill significantly affected seed yield/ha in the 1984 season only. There was a linear yield increase with increasing number of plants/hill in both seasons. The highest seed yield was obtained from a population density of three seeds/hill.

Introduction

The soils of the Sudan are deficient in nitrogen but most of the indigenous legumes, including faba beans, nodulate very well with naturally occurring rhizobia and they do not respond to nitrogen fertilizer application. Ishag (1970-71a) and Salih (1979-80) did not find a significant response to inoculation with different strains of *Rhizobium* in the presence or absence of nitrogen or to the application of nitrogen. Studies by other workers (Ayoub 1971-72; Babiker 1975-77; Salih 1976-78; Salih 1979-80; Salih 1981 a and b) showed that nitrogen application did not increase yield. Salih (1976-78) however, indicated that the application of nitrogen at 1 or 2 months after planting might increase seed yield.

Faba beans are known to be highly variable in their response to plant population. Ishag (1970-71b) found that yield was significantly less with 40cm or with a single plant/hole. At Zeidab, Salih (1978-79) studied the effect of four plant densities (one, two, three, and four seeds/hill at a hill spacing of 20 x 60 cm). He found that the seed yield at two, three, and four seeds/hill was greater than the yield at one seed/hill by 25, 34 and 39%, respectively. The number of pods/plant and percentage plant stand decreased progressively with increasing number of seeds/hill.

In the marginal agroclimatic zone of Gezira Research Station, the crop responded differently to different plant spacings: decreasing the spacing from 20 to 10cm and increasing the number of plants from one to two or three significantly increased grain yield (Ageeb 1980). This difference in response to plant population between traditional and marginal growing areas could be due to the fact that plants in the marginal zone are smaller and therefore the crop could be expected to benefit from a higher plant stand.

The objective of this experiment was to economize on sowing seeds of faba bean without sustaining yield losses and to find the optimum plant population for maximum seed yield under different levels of applied nitrogen.

Materials and Methods

Three plant populations (16.6, 33.3, and 49.9 plants/m^2) were grown with three levels of nitrogen (0, 43, and 86 kg N/ha) arranged in a split-plot design with four replications. Fertilizer levels were the main plots, while population density occupied the subplots. Subplots were 4.6 x 6.0m of which 3.6 x 5.2m was harvested for seed yield. The different plant densities were obtained by sowing one, two, and three seeds/hill, respectively, at 10cm hill to hill spacing in one row/60cm wide ridge.

Nitrogen as urea was broadcasted on the day of sowing. Each experiment received ten irrigations at intervals of 7 - 10 days. The experiment was sown on 18 October 1984 and 29 October 1985 at Shambat Research Station farm. The variety used was BF2/2.

Total seed yield was recorded for each plot. The number of pods/plant, 1000-seed weight, and plant height were determined from 20 randomly selected plants/plot.

Results and Discussion

The overall mean yield of the 1985 experiment exceeded that of the 1984 season by 23%. This was because in 1985 the experiment was planted at the optimum planting date for faba bean, as suggested by Salih and Khalafalla (1982). Early planting predisposed the plants to wilt and root rot diseases because of the high temperatures prevailing during the seedling stage. At harvest, the plant stand/m^2 was higher in 1985 than in 1984 by 44%.

Nitrogen application had no significant effects on seed yield but in 1985 the application of 43 kg N/ha increased yield by 11% over the control (Table 1). In both years, nitrogen application had no significant effect on plant height, number of pods/plant, or number of seeds/pod (Table 2). Differences in 1000-seed weights between plants grown with different levels of nitrogen were significant only in 1985. The heaviest seed weights were produced with 86 kg N/ha (Table 2).

No significant effect due to nitrogen application was detected on the number of plants/m^2 at harvest in 1985. However, in 1984 nitrogen application had a significant negative effect on the number of plants/m^2 compared to the control (Table 2).

In 1984, the interaction between plant density (number of seeds/hill) and nitrogen levels was significant ($P=0.05$) in terms of seed yield/ha. The highest seed yield, 2257 kg/ha, was obtained at a density of three seeds/hill and with 43 kg N/ha. The lowest seed yield, 1449 kg/ha, was obtained at a density of one plant/hill, without nitrogen (Table 1).

Table 1. Seed yield (kg/ha) of faba beans as affected by plant population and nitrogen application at Shambat in 1984 and 1985.

Plant population (plants/m^2)	Nitrogen rates (kg N/ha) 0	43	86	Mean
		1984		
		(±124)		(±62)
16.6	1821	1449	1978	1750
33.3	1823	1823	1993	1879
49.9	1876	2257	1987	2040
		(±124)		
Mean	1840	1843	1986	1890
		1985		
		(±162)		(±94)
16.6	2347	2902	2499	2582
33.3	2688	2729	2555	2657
49.9	2702	2959	2804	2822
		(±85)		
Mean	2579	2863	2619	2687

Table 2. Effect of plant population and nitrogen levels on some yield components of faba bean in 1984 and 1985.

	No. of pods/plant		No. of seeds/pod		1000-seed weight (g)		No. of plants/m^2		Plant height (cm)	
	1984	1985	1984	1985	1984	1985	1984	1985	1984	1985
Plant populations										
16.6 plants/m^2	30.8	44.8	2.35	2.67	407	373	16.6	16.3	69.0	88.3
33.3 plants/m^2	32.1	26.1	2.49	2.58	375	370	14.6	27.3	70.7	87.4
49.9 plants/m^2	27.2	18.1	2.11	2.59	356	363	14.0	37.2	68.6	85.2
SE+	0.86	0.93	0.06	0.04	6.57	1.31	0.41	0.94	1.10	2.10
Mean	30.0	2.97	3.32	2.61	379	368	15.1	26.9	69.4	87.0
Nitrogen rates (kg N/ha)										
0	28.2	28.9	2.35	2.62	386	365	16.1	27.1	70.4	86.8
43	31.6	29.8	2.49	2.61	377	364	14.8	25.8	69.7	88.6
86	30.3	30.4	2.11	2.61	375	376	14.3	27.9	68.2	85.5
SE+	1.57	1.01	0.06	0.06	4.43	2.27	0.36	0.68	0.98	1.34
Mean	30.0	2.97	3.32	2.61	379	368	15.1	26.9	69.4	87.0

In 1985, the interaction between plant density and nitrogen application was not significant for seed yield. For all plant densities, the highest seed yields were obtained with the application of 43 kg N/ha (Table 1).

The response of faba bean to nitrogen fertilizer application was low or nil, which was perhaps a reflection of the high nitrogen status of the soil, or may have been due to the presence of an active *Rhizobium* strain or strains in the soil, as the plant roots had many large nodules (Salih 1981a and b).

Increasing the number of seeds/hill increased seed yield linearly in both years, but the effect was only significant in 1984 (Table 1). In 1984, the highest *seed yield*, 2040 kg N/ha, was recorded at a density of three seeds/hill (49.9 plants/m^2) which out-yielded two plants/hill (33.3 plants/m^2) which, in turn, was greater than the seed yield at one and two seeds/hill (16.6 and 33.3 plants/m^2) by 14.2 and 7.9%, respectively. In 1985, the yield of plants at three seeds/hill surpassed the yield at one and two seeds/hill by 8.5 and 5.8%, respectively.

From Shambat, Taha *et al.* (1983) reported that plants at a density of three seeds/hill out-yielded those at a density of one and two seeds/hill by 12.7 and 10.2%, respectively.

Murinda and Saxena (1985) found that at ICARDA's station at Tel Hadya in northern Syria, increasing the plant population from 16.7 to 33.3 plants/m^2 increased the seed yield by 22.7% in 1980/81. The lack of response to variation in plant population levels implies a high degree of plasticity in the local cultivars. This behavior has been well documented (Hodgson and Blackman 1956).

At harvest, the established plant stand counts/m^2 for the three different plant populations in this experiment were less than the desired plant density. This was true in both seasons. The plant stand percentages at one, two, and three seeds/hill were 100, 43.8, and 28.1, respectively, in 1984 and 98.2, 82.0, and 74.5, respectively, in 1985.

In both seasons, there was a consistent trend for the number of pods per plant and 1000-seed weight to decrease as the number of seeds/hill increased from one to three seeds/hill. Neither nitrogen nor number of seeds/hill had any significant effect on plant height (Table 2).

The effect of number of seeds/hill on the number of seeds/pod was significant only in 1984. The smallest number of seeds/pod was obtained from pods on plants grown at three seeds/hill (Table 2). As plant density increased, the yield/plant and number of pods/plant decreased but yield/unit area of land increased; the number of seeds/pod and seed size were not very much influenced by crop density (El Saeed 1968; Kambal 1968; Ishag 1971; Pandey 1981).

In conclusion, it is recommended that for economical seed yield, faba beans should be planted at Shambat or Khartoum Province as one row/ridge (60 cm wide) in three-seeded hills 10 cm apart, and without nitrogen application.

References

Ageeb, O.A.A. 1980. Faba bean plant population trial. Annual Report 1980. Gezira Research Station, Wad Medani, Sudan.

Ayoub, A.T. 1971-72. Ful masri (faba bean) fertilizer experiment. Page 59 *in* Annual Report 1971-72. Hudeiba Research Station, Ed-Damer, Sudan.

Babiker, I.A. 1975-77. Broad bean NP fertilizer and time of application. Annual Reports 1975-77. Hudeiba Research Station, Ed-Damer, Sudan.

El Saeed, E.A.K. 1968. Agronomic aspects of broad bean (*Vicia faba* L.) grown in the Sudan. Experimental Agriculture 4:151-159.

Hodgson, G.L. and Blackman, G.E. 1956. An analysis of the influence of plant density on the growth of *Vicia faba*. Journal of Experimental Botany 7:147-165.

Ishag, H.M. 1970-71a. Effect of seed inoculation on plant growth and yield of field beans. Annual Report 1970-71. Hudeiba Research Station, Ed-Damer, Sudan.

Ishag, H.M. 1970-71b. Effect of spacing between holes and number of seeds per hole on yield and yield components. Annual Report 1970-71. Hudeiba Research Station, Ed-Damer, Sudan.

Kambal, A.E. 1968. A study of the agronomic characters of some varieties of *Vicia faba*. Sudan Agricultural Journal 3(1): 1-10.

Murinda, M.V. and Saxena, M.C. 1985. Agronomy of Faba Beans, Lentils and Chickpeas. Pages 229-244 *in* Proceedings of an International Workshop on Faba Beans, Kabuli Chickpeas, and Lentils in the 1980's (Saxena, M.C. and Varma, S., eds). ICARDA, 16-20 May 1983, Aleppo, Syria.

Pandey, R.K. 1981. Time of sowing - a major factor for high seed yields of faba bean in Northern India. FABIS Newsletter 3: 43-44.

Salih, F.A. 1976-78. Effect of level and time of nitrogen application on the yield of faba beans. Annual Reports 1976-78. Hudeiba Research Station, Ed-Damer, Sudan.

Salih, F.A. 1978-79. Faba bean seed rate trial. Annual Report 1978-79. Hudeiba Research Station, Ed-Damer, Sudan.

Salih, F.A. 1979-80. Faba bean fertilizer experiment and faba bean fertility/inoculation trials. Annual Reports 1979-80. Hudeiba Research Station, Ed-Damer, Sudan.

Salih, F.A. 1981a. Effect of nitrogen rate and time of application on the yield and yield components of field bean. Annual Report 1980. Shambat Research Station.

Salih, F.A. 1981b. Effect of nitrogen and phosphorus fertilization on faba bean in the northern part of the Sudan. FABIS Newsletter 3: 41-42.

Salih, F.A. 1981c. A review on the effect of seed rate and plant population on grain yield of faba bean in Sudan. FABIS Newsletter 3: 44-46.

Salih, F.A. and Khalafalla. 1982. Influence of sowing date on the performance of four faba bean varieties at different locations in Sudan. FABIS Newsletter 5:18-19.

Taha, M.B., Mohamed, G.E., Salih, F.A. and Ibrahim, H.S. 1983. Effect of date of planting and plant population on faba bean yield. Sudan 1983/84 crop season. Paper presented at the Fifth Annual Coordination Meeting. ICARDA/IFAD Nile Valley Project on Faba Bean. 13-17 September 1984, Cairo, Egypt. ICARDA, Aleppo, Syria.

تأثير التسميد الازوتي وعدد النباتات في الجورة على غلة الفول (Vicia faba)

ملخص :

تمت دراسة تأثير ثلاث كثافات نبتية (16.6 ، 33.3 و 49.9 نباتات/م²) مع ثلاثة مستويات من التسميد الازوتي (0 ، 43 و 86 كغ/آزوت /هـ) على غلة الفول ومكوناتها في موسمي (1984 و 1985) لدى محطة بحوث شمبات . لم يكن ثمة تأثير للتسميد الازوتي على الغلة الحبية بالهكتار في السنتين . أما عدد النباتات/جورة فقد أثر بصورة معنوية على الغلة الحبية/هـ في موسم 1984 فقط . وكانت هناك زيادة خطية في الغلة مع ازدياد عدد النباتات/جورة في كلا الموسمين . وقد تم الحصول على أعلى غلة حبية من الكثافة النبتية ثلاث بذور/جورة .

Evaluation of Different Planters for Faba Beans

Mamoun I. Dawelbeit
Rahad Research Station,
El-Fau,
SUDAN

Abstract

Three different planting machines, a Lilliston row planter, a Nordsten seed drill, and a Hestair Stanhay precision planter, were compared for their effect on seed placement, emergence, and yield. All the planters performed satisfactorily and there were no significant differences between machines in seed placement or seedling emergence. Mean yields were highest for the Lilliston planter, followed by the Stanhay planter and the seed drill.

Introduction

Kepner *et al.* (1978) stated that a seed planter is required to open the seed furrow to the proper depth, meter the seed and deposit it in the furrow in an acceptable pattern, and to cover the seed and compact the soil correctly for the type of crop involved.

Various factors that affect seed metering and placement were summarized by Chhinnan *et al.* (1975). These were (a) variation in seed size and shape, (b) planting speed, (c) design of metering and dropping mechanisms, (d) design of seed hopper, (e) level of seed in the hopper, and (f) condition of the soil furrow into which the seeds are dropped.

The objective of this experiment was to test and evaluate three different planting machines for faba beans in the Rahad area of Sudan.

Materials and Methods

The three planting machines compared in this study were a Lilliston 8200 planter, a Nordsten combi-matic type CKF seed drill, and a Hestair Stanhay Jumbo precision seed planter, Series II.

The Lilliston planter was equipped with four planter units, double disc openers, and press wheels. It had a horizontal plate seed metering mechanism with a knocker and a cut-off device. A cotton seed plate was used in this experiment. The seed drill had a fluted wheel seed metering device and was equipped with tine openers. There was no covering device. The operating width of the seed drill was 2.4 m. The precision seed planter had a belt-type seed metering device, runner type openers, front wheels, and rear drive press wheels. Six planter units were carried on the tool bar.

All the machines were full-tractor mounted. The Hestair Stanhay planter had, in addition, a hydraulic assist wheel.

The faba bean cultivar, BF 2/2 (100-seed weight 34 g, diameter 8-12 mm), was used in this experiment. The treatments comprised the three planting machines each adjusted for two row widths, 40 and 60 cm. Sowing depth was 3 cm and tractor speed 3 km/h. Plot size was 5x20 m. The design was randomized complete blocks with six treatments and four replications.

Seeds were sown on 6 November 1985 at a seed rate of 120 kg/ha. Plants were irrigated every 10 days up to flowering and then at weekly intervals to maturity. Superphosphate (43 kg P_2O_5/ha) and urea nitrogen (86 kg N/ha) were applied at sowing and 3 weeks after sowing, respectively.

Results and Discussion

Seed placement

Distances between dropped seeds were randomly measured at ten points in each plot. Mean distances between dropped seeds, standard deviation, and coefficient of variation (CV) are shown in Table 1.

The coefficient of variation showed that the accuracy of seed placement was not significantly different for the three machines.

Seed emergence

Emergence data were calculated following the procedure described by Bilbro and Wanjura (1982) and included the following.

Table 1. Seed placement, emergence, and yield data for faba beans using three types of planters.

Machine	Lilliston planter		Nordsten seed drill		Stanhay planter	
Row spacing (cm)	40	60	40	60	40	60
Seed placement						
Mean distances between seeds (cm)	10.0	8.4	11.4	8.9	11.1	8.5
Standard deviation	4.2	3.1	4.9	3.4	4.7	3.5
Coefficient of variation (%)	42	37	43	39	42	41
Emergence						
MED	11.0	11.6	11.8	11.2	10.7	11.9
PE	83	77	96	70	86	82
	(80)*		(83)		(84)	
ERI	18	22	13	20	14	22
	(20)		(16.5)		(18)	
Population (plants/m^2)	38	28	30	23	30	30
	(33)		(26.5)		(30)	
Yield						
kg/ha	1104	938	859	792	880	979
	(1021)		(825.5)		(929.5)	

*Figures in parentheses are means.

Mean emergence dates (MED)

$$MED = \frac{N_1D_1 + N_2D_2 + \dots\dots\dots + N_nD_n}{N_1 + N_2 + \dots\dots\dots\dots\dots + N_n}$$

where

N = number of seedlings since previous count.
D = number of days after planting.

The higher the MED, the longer the delay of seed emergence. Table 1 shows MED for the different treatments. The lowest MED was for the Stanhay planter at 40 cm spacing while the highest was for the seed drill at 40 cm spacing. However, the MED values were not significantly different for the different treatments.

Percentage of emerged seedlings (PE)

$$PE = \frac{\text{Total emerged seedlings/m}}{\text{Number of seeds planted/m}} \times 100$$

The highest and lowest values of PE were 96 and 70, obtained at 40 and 60 cm drilling, respectively.

Emergence rate index (ERI)

$$ERI = \frac{\text{Total emerged seedlings/m}}{\text{MED}}$$

From the above equation, the higher the value of ERI, the better. the emergence. ERI values in this experiment were 13-22. The Lilliston planter had the highest mean ERI.

Plant population

Plant population ranged from 38 to 23 plants/m^2. The highest was obtained at 40 cm with the Lilliston planter, while the lowest was obtained at 60 cm with the Nordsen seed drill.

Yield

Seed yield ranged from 1104 to 792 kg/ha. The highest yield, which was significantly (P=0.05) higher than with the other treatments, was obtained at 40 cm with the Lilliston planter. Mean yields for the three machines were 1021, 825.5, and 929.5 kg/ha for the Lilliston planter, seed drill, and Stanhay planter, respectively (Table 1).

Conclusions

1. The three machines all performed satisfactorily.
2. There were no significant differences between treatments in mean distance between seeds, standard deviation, and coefficient of variation of mean distance between seeds.
3. There were no significant differences between treatments.
4. Mean yields were highest (1021 kg/ha) for the Lilliston planter, followed by the Stanhay planter (929.5 kg/ha) and the seed drill (825.5 kg/ha).

References

Bilbro, J.D. and Wanjura, D.F. 1982. Soil crusts and cotton emergence relationship. Transactions of the American Society of Agricultural Engineers 25 (6): 1484-1487, 1494.

Chhinnan, M.S., Young, J.H. and Rohrbach, R.P. 1975. Accuracy of seed spacing in peanut planting. Transactions of the American Society of Agricultural Engineers 18 (5): 828-831.

Kepner, R.A., Bainer, R., Barger, E.L. 1978. Principles of Farm Machinery. AVI Publishing Company, Westport, Conneticut, USA.

تقييم بذارات الفول المختلفة

ملخص :

اجريت مقارنة بين ثلاث بذارات هي بذارة السطور ليليستون ، والبذارة نوردستون ، والبذارة الدقيقة هستير ستانهي وذلك لمعرفة تأثير كل منها على وضع الحبة في التربة والانبات والغلة . وكان اداء جميع البذارات مُرْضيا لانه لم تظهر فروق معنوية فيما بينها من حيث زراعة البذور في التربة أو إنبات البادرات . وكانت معدلات الغلة اعلى عند استعمال بذارة ليليستون ، يليها بذارة ستانهي ، ثم بذارة نوردستون .

Pests and Diseases

Preliminary Biological Studies of Pulse Beetle, Callosobruchus chinensis (L.) on Corticated and Decorticated Faba Beans, Vicia faba L.

Shiv K. Singal
Department of Entomology,
Haryana Agricultural University,
Hisar - 125004, Haryana,
INDIA.

Abstract

Biological studies of the pulse beetle, *Callosobruchus chinensis*, on corticated and decorticated faba beans, *Vicia faba*, revealed that the seed coat acts as a barrier to penetration of first instar larvae into cotyledons and emergence of adult beetles from corticated beans. The mortality of larvae and adults was 83.3% in corticated beans and 32.8% in decorticated beans. The per cent adult emergence was higher (66.7) in decorticated beans than in corticated beans (16.6).

Introduction

Faba bean, *Vicia faba* L., is one of the most important winter crops for human consumption in the Middle East (Duke 1981). The most commonly occurring bruchid species in the Asian region, *Callosobruchus chinensis*, has already been recorded on 10 stored pulses, including faba beans (Southgate 1982; Singal and Singh 1986). A literature search revealed that no studies on the biology of the pulse beetle have been conducted on faba bean. This experiment was initiated to study the biology of *C. chinensis* on corticated and decorticated faba beans.

Materials and Methods

The beetle, *C. chinensis* was reared in covered glass jars containing chickpea at 30+1°C in a BOD incubator. Freshly emerged males and females from this culture were released onto corticated and decorticated faba beans (var Hisar Local) in two large petri dishes. The females oviposited and glued their eggs to the surfaces of both corticated and decorticated beans. From each type of bean, 120 beans carrying one egg each were selected. Each group of 120 beans was placed in a petri dish and incubated at 30+1°C for 50 days in a BOD incubator. Emerged adults were counted and removed to prevent further breeding. The larvae which failed to penetrate the seed coat and which were found dead on cotyledons on both categories of beans were counted after 50 days. Similarly, the adults which emerged or failed to emerge and the average developmental period were calculated.

Results and Discussion

The large number of first instar larvae, though known to be very hardy, could not penetrate the seed coat of corticated beans. Dead larvae were found to be lying half inside the egg shell with their heads inside the seed coat. The mortality of the first instar larvae was much less on decorticated beans. This suggests that the thickness of the bean coat, which is greater in corticated beans, acted as a barrier to penetration of the first instar larvae.

Similarly, larval mortality was higher on cotyledons of corticated than on those of decorticated beans. This is probably due to the great effort made by the larvae to penetrate the seed coat (Table 1).

The percent emergence of *C. chinensis* from corticated and decorticated faba bean seeds was 16.6 and 66.7, respectively. The extremely low emergence from corticated beans may be due to the thickness of the seed coat which not only acted as a barrier to penetration of larvae into cotyledons but to some extent also hindered the emergence of adult beetles. These observations are in agreement with those of El Sawaf (1956) and Podoler and Applebaum (1968).

These preliminary biological studies reveal that if complete resistance to pulse beetle is to be acquired, breeders may have to look towards evolving a variety of faba bean with a thicker seed coat to prevent beetle attack during storage.

Acknowledgement

The author thanks Professor A.N. Verma, Department of Entomology, H.A.U., Hisar, Haryana for providing laboratory facilities.

References

Duke, J.A. 1981. Handbook of Legumes of World Economic Importance. Plenum Publishing, New York, USA. 345 pp.

El-Sawaf, S.K. 1956. Some factors affecting longevity, oviposition and rate of development in Southern cowpea weevil *C. maculatus* (Coleoptera:Bruchidae). Bulletin of the Society of Entomology, Egypt 40: 29-95.

Podoler, H. and Applebaum, S.W. 1968. Physiological aspects of host-specificity in the Bruchidae V. Varietal differences in the resistance of *Vicia faba* L. (broad beans) to *C. chinensis.* Journal of Stored Products Research 4: 9-11.

Singal, S.K. and Singh, Zile. 1986. *Vicia faba* a new host record of *Callosobruchus chinensis* (L.) from India. Bulletin of Grain Technology, India. (In press.)

Southgate, B.J. 1982. The importance of Bruchids (Coleoptera Bruchidae) as pests of pigeonpea, *Cajanus cajan.* Tropical Grain Legume Bulletin 24: 21-24.

Table 1. Larval mortality and adult emergence of *Callosobruchus chinensis* (L.) on corticated and decorticated faba bean seeds.

Type of seed	Total no. of seeds and eggs	Larval mortality	Adults emerged	Adults failed to emerge	Average developmental period (days)
Corticated	120	78 (65)*	20 (16.6)	22 (18.3)	25
Decorticated	120	27 (22.5)	80 (66.7)	13 (10.3)	23.5

* Figures in parentheses are percentages.

دراسات بيولوجية اولية عن خنفساء البقول Callosobruchus chinensis (L.) على الفول Vicia faba المقشور وغير المقشور

ملخص :

ان الدراسات البيولوجية لخنفساء الفول Callosobruchus chinensis على الفول المقشور وغير المقشور Vicia faba قد اظهرت أن غلاف البذرة يشكل عائقا امام دخول اليرقة وهي في الطور الاول الى الفلقتين ، وظهور الخنفساء الكاملة من بذور الفول عير المقشورة . وقد كانت نسبة موت اليرقات والحشرات الكاملة 83.3 % في بذور الفول غير المقشورة و 32.8 % في بذور الفول المقشورة . كما كانت النسبة المئوية لظهور الحشرات الكاملة من بذور الفول المقشورة أعلى (66.7) من بذور الفول غير المقشورة (16.6).

Comparison of Some Methods for Evaluation of Reaction of Different Faba bean Genotypes to Ascochyta fabae

B. Tivoli[1], B. Reynaud[1], N.Maurin[1], P. Berthelem[2] and J. Le Guen[2]

1. Station de Phytopathologie

2. Station d'Amelioration des Plantes INRA, BP 29 35 650 Le Rheu, FRANCE

Abstract

Differences in the reaction of nine faba bean (*Vicia faba*) genotypes and one of narbon vetch (*Vicia narbonensis*) to *Ascochyta fabae* were studied in pot culture in the greenhouse and in the field under artificial epiphytotics. The greenhouse test, although simpler and more economical, was as effective as the field test in ranking genotypes of faba bean for their susceptibility to the disease and can thus be used by breeders.

Introduction

With an increase in faba bean cultivation in France, the disease caused by *Ascochyta fabae* is spreading. The primary inoculum comes either from infected plant debris or from diseased seeds. The first symptoms appear in February and develop throughout crop growth, the final stage being the attack of the pods and developing seeds.

Chemical control methods only partially inhibit the parasite so research is being done in collaboration with geneticists to develop resistant lines and methods to evaluate varietal behavior.

Some studies on *A. fabae* have already been carried out in other countries (Hanounik and Maliha 1983; Lockwood *et al.* 1985; Jellis *et al.* 1985) and recently, researchers in France commenced similar studies. The development of lines resistant to different pathogens, and to *A. fabae* in particular, requires a quick and simple test so that plant selection is based on reliable and reproducible criteria. Therefore, in this study we compared two methods for evaluation of varietal behavior.

(i) A method using plants grown in pots in the greenhouse that were sprayed with a spore solution.

(ii) A method simulating natural infection by inoculating experimental plots in the field.

Materials and Methods

The plants

The plants and cultivation conditions are the same as those used by Tivoli *et al.* (1987) in studies with *Botrytis fabae.*

The plants were grown in the field during two consecutive years (sowing on 27 October 1983 and 27 November 1984) and in pots after a 5 week period of vernalisation at 3-5°C.

The pathogen

In order to retain virulence, *A. fabae* was reisolated from infected plants each year and then grown on specific media to stimulate sporogenesis. The growth media used were malt extract agar and barley grain. The methods used in developing spores on barley grain medium and harvesting them for infection studies were the same as those used for *B. fabae* (Tivoli *et al.* 1987).

Methods of inoculation

In pots

Inoculation was carried out at the 5-7 leaf stage and at the flowering stage. Each plant was sprayed with a spore suspension containing 0.5 million spores/ml.

The inoculated plants were kept in a greenhouse at a day and night temperature of 20° and 15°C, respectively, and were covered with polyethylene bags for 5 days to maintain saturated humidity. After the bags were removed the plants were sprayed with water twice a day.

In the field

The procedure used for field inoculation was the same as that used by Tivoli *et al.* (1987). Distribution of inoculum was carried out during the winter (9 January 1984 and 6 February 1985) when the plants had reached the three leaf stage. During the rainy periods that followed infection, the spores produced by the pycnidia were dispersed by the "splash" phenomenon.

Data collection

Disease severity was evaluated using the percentage of stems and pods attacked and a score of 1-5 for the leaves and stems as established by Kharbanda and Bernier (1980). The stems were scored at every internode and the leaves at each node of the plant. An assessment of the disease per plant was obtained by calculating the leaf and stem averages from all the recorded values per plant.

Results

Pot study

The first signs of disease appeared on both the leaves and stems 10-15 days after inoculation. The symptoms were generally more serious on the upper part of the plant than at the base. Levels of disease were variable on the leaves with disease scores of 1-4, while scores on the stems were 1-2.5 (Table 1).

The different genotypes demonstrated consistently stable behavior during the 2 years of experimentation.

Table 1. Average disease scores per plant of nine genotypes of *V. faba* and one of *V. narbonensis* (V.n.) after spraying with *A. fabae* spores at the young plant and flowering stages.

1983/84								1984/85		
Young plant stage				Flowering stage				Flowering stage		
Leaves		Pods		Leaves		Pods		Leaves		Pods
V.n.	1.0	V.n.	1.0	V.n.	1.0	V.n.	1.0	29H	1.1	1.3
29H	1.1	29H	1.0	29H	2.0	29H	1.5	V.n.	1.2	1.0
29E	1.1	29E	1.0	LCF	2.5	3.33	1.7	Bourdon	1.9	1.3
Bourdon	2.1	Bourdon	1.1	Bourdon	2.9	S45	1.8	S45	2.0	1.5
S45	2.9	Soravi	1.4	S45	3.0	29E	1.9	LCF	2.2	1.5
Soravi	3.2	245.17	1.4	245.17	3.2	245.17	1.9	Soravi	2.3	1.4
245.17	3.3	S45	1.5	29E	3.3	LCF	1.9	245.17	2.5	1.4
48B	3.5	LCF	1.7	3.33	3.3	Bourdon	2.0	3.33	3.3	1.9
3.33	4.0	3.33	1.7	Soravi	3.7	Soravi	2.1	48B	3.8	2.2
LCF	4.3	48B	1.9	48B	4.0	48B	2.5	29E		
Calculated F value	180.4		22.3		32.5		7.0		7.3	2.3
F at P=0.05	1.9		1.9		1.9		1.9		2.5	2.5
LSD	0.4		0.2		0.4		0.4		0.9	n.s

n.s.= not significant.

Vetch was unaffected with only a few atypical symptoms appearing at the site of the inoculum. Line 29H was resistant, with a few characteristic symptoms developing on the leaves. Lines 48B, 3.33, and to a lesser degree LCF and the variety Sovari, were rated susceptible to highly susceptible as their leaves and stems were seriously affected by the disease. Some genotypes such as 29E and Bourdon were, however, moderately resistant.

Field study

The disease developed differently during the 2 years of cultivation (Table 2). In 1983/84, it appeared on the leaves in February 1984, then progressed to the stems without affecting the pods. The extent of the disease on the leaves and stems was evaluated on 1 June 1984 using the 1-5 scoring system. In 1984/85, it appeared on the leaves in March 1985 then progressed to the stems and pods. The most significant results came from leaf scores taken on 15 May 1985, and the rate of damaged stems and pods recorded on 4 July 1985.

Several groups could be distinguished:

1. *V. narbonensis* did not show characteristic symptoms and a few of the pods (7%) had atypical symptoms.
2. 29E and 29H were resistant: the leaf scores were 1.1 and 1.7 in 1984 and 1985, respectively. Despite quite a strong attack on stems, the rate of pod infection was low (8 and 7%).
3. The varieties Bourdon and Sovari, and the line S 45 appeared to be moderately resistant with leaf scores between 2.2 and 2.9, and more pods affected (up to 32%) than in 29E and 29H.
4. The lines LCF, 3-33, and especially 245-17 and 48B were the most susceptible. The base of the plant was totally invaded by the fungus and there was extensive leaf damage (score 4) and rings round the stem (score 3 and 4). The pathogen developed easily on these lines and attacked a large number of the pods (34 - 61%).

The rank orders obtained in each of the 2 years agreed closely, and the rank order obtained in the field corresponded to that obtained in the greenhouse after spraying.

Conclusion

These results show that the greenhouse test is as effective as the field evaluation and thus breeders can use this simple method for establishing the rank

Table 2. Average disease scores for leaves and stems and percent damaged stems and pods of nine genotypes of *V. faba* and one of *V. narbonensis* (V.n.) after inoculation with *A. fabae* in the field.

1983/84				1984/85					
Leaf scores		Stem scores		Leaf scores		Damaged stems (%)		Damaged pods (%)	
V.n.	1.0	V.n.	1.0	V.n.	1.4	V.n.	9.8	29H	7.0
29E	1.0	29E	1.0	29E	1.7	29H	23.9	V.n.	7.3
29H	1.0	29H	1.0	29H	1.8	29E	24.0	29E	8.2
Bourdon	2.6	Bourdon	1.9	Bourdon	2.2	Bourdon	31.8	Bourdon	16.9
S45	2.6	LCF	2.0	S45	2.7	245.17	39.4	S45	26.5
Soravi	2.9	S45	2.1	Soravi	2.8	3.33	41.1	Soravi	32.3
LCF	3.1	Soravi	2.2	245.17	2.9	Soravi	43.4	3.33	34.5
3.33	3.5	3.33	2.4	3.33	2.9	S45	43.5	LCF	45.4
48B	3.7	245.17	2.9	LCF	3.0	LCF	59.8	245.17	54.8
245.17	3.9	48B	3.1	48B	3.3	48B	72.9	48B	61.2
Calculated F value	64.5		81.5		35.3		5.9		44.2
F at P=0.05	2.2		2.2		2.5		2.5		2.5
LSD	0.4		0.2		0.3		22.2		8.8

order of genotypes for potential performance in the field. The next ideal step would be to find a way to condense the test still further, as did Dodd (1971), by carrying it out on detached leaves maintained at survival level. Trials done so far have, however, given heterogeneous results; the symptoms do not appear on all the leaves.

The results on varietal performance are very encouraging because, though they indicate various degrees of susceptibility in the plant material and thus the necessity to improve resistance, they also bring to light major variations in *V. faba* and *V. narbonensis.* These results confirm those obtained by Bond and Pope (1980) and are of additional interest due to the identification of less susceptibility in French plant material in general and tolerance of lines 29H and 29E in particular.

References

Bond, D.A. and Pope, M. 1980. *Ascochyta fabae* on winter beans (*Vicia faba*): pathogen spread and variation in host resistance. Plant Pathology 29: 59-65.

Dodd, I.J. 1971. Some aspects of the biology of *Ascochyta fabae* Speg. Ph.D. thesis. University of Hull, England.

Hanounik, S.B. and Maliha, N.F. 1983. Screening for resistance to diseases and chemical control of major diseases in faba beans. Proceedings of the International Workshop on Faba Beans in the 1980's, ICARDA, 16-20 May 1983, Aleppo, Syria. ICARDA, Aleppo, Syria.

Jellis, G.J., Lockwood, G. and Aubury, R.G. 1985. Phenotypic influences on the incidence of infection by *Ascochyta fabae* in spring varieties of faba beans (*Vicia faba*). Plant Pathology 34: 347-352.

Kharbanda, P.D. and Bernier, C.C. 1980. Cultural and pathogenic variability among isolates of *Ascochyta fabae*. Canadian Journal of Plant Pathology 2: 139-142.

Lockwood, G., Jellis, G.J. and Aubury, R.G. 1985. Genotypic influences on the incidences of infection by *Ascochyta fabae*. Plant Pathology 34: 341-346.

Tivoli, B., Berthelem, P., Leguen, J. and Onfroy, C. 1987. Etude methodologique pour l'appreciation du comportement de la feverole vis-a-vis de *Botrytis fabae*. FABIS Newsletter 16. In press.

مقارنة بين الطرائق المستخدمة لتقييم تفاعل الطرز الوراثية المختلفة من الفول للاصابة بمرض التبقع الاسكوكيتي

ملخص :

درست ردود الفعل المختلفة عند تسعة طرز وراثية من الفول (Vicia faba) وطراز واحد من البقية النربونية (Vicia narbonensis) للاصابة بالتبقع الاسكوكيتي Ascochyta fabae في تجربة بالاصص في كل من البيت الزجاجي (الدفيئة) والحقل تحت ظروف العدوى الاصطناعية. وكان الاختبار في البيت الزجاجي فضلا عن كونه اكثر بساطة واقتصادية ـ فعالا بنفس القدر للاختبار الحقلي في ترتيب الطرز الوراثية للفول حسب تحسسها للاصابة بالمرض ، وهكذا يمكن استعماله من قبل مربي النبات .

Weed Survey of Faba Bean Fields in Syria with Special Reference to Orobanche spp. and Cuscuta spp.

J. Sauerborn and M.C. Saxena
ICARDA, P.O. Box 5466, Aleppo, SYRIA.

Abstract

In 1986, faba bean fields in Syria were surveyed for the general weed situation and for the presence of the parasitic weeds *Orobanche* spp. and *Cuscuta* spp. The survey was carried out along the Euphrates river from Raqqa to Abu Kamal and northeast of Aleppo (Kafr Antoon, Al Bab, Kuwayres). In total, 38 fields were checked for the parasitic weeds, while 23 fields were surveyed for the general weed flora. The frequency of parasitic weeds was higher in the area northeast of Aleppo than along the Euphrates river.

Introduction

Faba bean is an economically important crop in Syria. Its productivity is severely affected by such parasitic weeds as *Orobanche* spp. and *Cuscuta* spp. Yield loss due to *Orobanche crenata* ranges from 5 to 100%. The control of *Orobanche* spp. is very difficult as the seeds mainly germinate under the influence of a germination stimulant exuded by the host roots and a few non host plants. A survey was undertaken to find out the frequency of the parasitic weeds in two major production areas in the northern part of Syria.

Materials and Methods

In the Euphrates valley and in the area northeast of Aleppo (Kafr Antoon, Al Bab, Kuwayres) a survey for weed infestation in faba bean fields was done in the 1986 crop season when faba bean plants had reached maturity. Along the Euphrates river 21 fields were surveyed for the parasitic weeds *Orobanche* spp. and *Cuscuta* spp. and 12 fields for the general weed infestation. In the area northeast of Aleppo 17 faba bean fields were checked for *Orobanche* spp. and *Cuscuta* spp., while 11 fields were surveyed for their general weed flora. Weeds were collected for species identification. To analyse the weed flora in the field, the relative area of ground covered by total vegetation and by individual species was estimated. The infestation level by *Orobanche* spp. in the field was expressed as the percentage of faba bean plants infested by the parasite.

The frequency of weed occurrence was calculated using the equation

$$f = 100 \times \frac{n}{m}$$

where n = number of surveys in which the respective species are found and m = total number of surveys. For each species, the average degree of coverage (dc) was calculated as follows

$$dc = \frac{\Sigma dc \text{ of the species}}{m}$$

All the surveyed fields were irrigated and weeded once or twice.

Results and Discussion

Orobanche spp. were not found in fields along the Euphrates river and farmers mentioned *Orobanche* spp. only as weeds common in tomatoes and/or potatoes but not in legume crops. *Cuscuta* spp. were found in 6 of 21 fields (30%). In the area northeast of Aleppo *O. crenata* and *O. aegyptiaca* were found in more than 70% of the surveyed fields. The parasitic weed *Cuscuta* spp. had a frequency of 55% (Table 1). The infestation level for these fields was 21% (0.5-100%) for *Orobanche crenata* and 3% (0.5-30%) for *O. aegyptiaca.*

During the general weed survey, more weed species were found and the average number of species per field was higher in the area northeast of Aleppo than in the Euphrates valley. The average cover by weeds was 30% in the area northeast of Aleppo compared with 44% along the Euphrates river (Table 2).

Table 1. Frequency (%) of *Orobanche* spp. and *Cuscuta* spp. in faba bean fields in two areas of Syria.

Weed	Euphrates valley	NE of Aleppo
Orobanche crenata	0	71
O. aegyptiaca	0	76
Cuscuta spp.	30	55

Table 2. Weed species and their importance in two areas of Syria.

	Euphrates valley (12 fields surveyed)	NE of Aleppo (11 fields surveyed)
Total weed species	45	73
Average no. of species/field	12	23
Weed cover (%)	44	30
Crop cover (%)	48	64

The frequency value indicates the percentage of weed samplings in which a particular weed species appeared. Frequency values of > 50% were found for 10 species in the Euphrates valley, and for 19 species in the area northeast of Aleppo. Most of the species which had a high frequency value also had a high degree of coverage (Tables 3 and 4).

It is worth noting that farmers collected the weeds as fodder for their animals and fields which were already harvested were grazed by animals. This highlights the importance of weeds as fodder.

Table 3. Frequency and average cover of common weeds in faba bean fields along the Euphrates river (12 fields surveyed).

Weed species	Frequency (%)	Weed species	Average cover (%)
Melilotus indica	83	*Melilotus indica*	17.6
Avena sterilis	75	*Phalaris brachystachyos*	7.4
Polygonum aviculare	75	*Erigeron linifolius*	7.3
Phalaris brachystachyos	67	*Lolium perenne*	6.0
Sonchus oleraceus	67	*Convolvulus arvensis*	5.3
Setaria viridis	58	*Setaria viridis*	4.1
Chenopodium album	50	*Cynodon dactylon*	3.4
Convolvulus arvensis	50	*Polygonum aviculare*	3.1
Cuscuta sp.	50	*Sonchus oleraceus*	3.1
Lolium perenne	50	*Avena sterilis*	3.0

Table 4. Frequency and average cover of common weeds in faba bean fields NE of Aleppo (11 fields surveyed).

Weed species	Frequency (%)	Weed species	Average cover (%)
Convolvulus arvensis	91	*Orobanche crenata*	3.2
Amaranthus blitoides	82	*Sinapis arvensis*	2.9
Descurainia sophia	82	*Descurainia sophia*	2.6
Phalaris brachystachyos	82	*Coriandrum sativum*	2.4
Orobanche aegyptiaca	76	*Melilotus indica*	2.4
Avena sterilis	73	*Fumaria asepala*	2.0
Chenopodium vulvaria	73	*Polygonum aviculare*	2.0
Galium tricorne	73	*Chenopodium vulvaria*	1.9
Polygonum aviculare	73	*Convolvulus arvensis*	1.9
Orobanche crenata	71	*Avena sterilis*	1.8
Amaranthus retroflexus	64	*Amaranthus blitoides*	1.8
Chenopodium album	64	*Phalaris brachystachyos*	1.8
Sinapis arvensis	64	*Triticum aestivum*	1.5
Torilis leptophylla	64	*Convolvulus althaeoides*	1.2
Coriandrum sativum	55	*Amaranthus retroflexus*	1.0
Cuscuta spp.	55	*Diplotaxis erucoides*	0.8
Euphorbia spp.	55	*Euphorbia* spp.	0.8
Melilotus indica	55	*Orobanche aegyptiaca*	0.8
Vaccaria pyramidata	55	*Fumaria parviflora*	0.7

حصر للاعشاب في حقول الفول بسورية مع تركيز خاص على الهالوك (الجعفيل) .Orobanche spp والحامول Cuscuta spp.

ملخص :

اجرى في عام 1986 حصر للاعشاب في حقول الفول بسورية لبيان الوضع العام للاعشاب ولتحديد وجود العشبين الطفيليين الهالوك .Orobanche spp والحامول Cuscuta spp. وقد اجريت الدراسة على امتداد نهر الفرات من الرقة الى ابو كمال وفي شمال شرق حلب (كفر انطون والباب وكويرس). وبصورة اجمالية تم فحص 38 حقلا لتحديد الاعشاب الطفيلية ، و 23 حقلا لحصر نباتات Flora الاعشاب بصورة عامة . وقد كان تكرار الاصابة بالاعشاب الطفيلية في منطقة شمال شرق حلب اعلى مما هي عليه على امتداد نهر الفرات .

Contributors' Style Guide

Policy
The aim of FABIS Newsletter is to publish quickly the results of recent research on faba beans. Articles should normally be brief, confined to a single subject, good quality, and of primary interest to research, extension, and production workers, and administrators and policy makers.

Style
Articles should have an abstract (maximum 250 words) and whenever possible the following sections:introduction, materials and methods, and results and discussion. Authors should refer to recent issues of FABIS for guidance on format. Articles will be edited to maintain uniform style but substantial editing will be referred to the author for his/her approval; occasionally, papers may be returned for revision.

Disclaimers
The views expressed and the results presented in the newsletter are those of the author(s) and not the responsibility of ICARDA. Similarly, the use of trade names does not constitute endorsement of or discrimination against any product by ICARDA.

Manuscript
Articles should be typed double-spaced on one side of the page only. The original and two other legible copies should be submitted. The contributor should include his name and initials, title, program or department, institute, postal address, and telex number if available. Figures should be drawn in India ink; send original artwork, not photocopies. Define in footnotes or legends any unusual abbreviations or symbols used in a figure or table. Good quality black and white photographs are acceptable for publication. Photographs and figures should preferably be 8.5 cm or 17.4 cm wide.

Units of measurement are to be in the metric system; e.g. t/ha, kg, µg, m, km, ml (=milliliter), m^2.

The numbers one to nine should be written as words except in combination with units of measure; all other numbers should be written as numerals; e.g., nine plants, 10 leaves, 9 g, ninth, 10th, 0700 hr.

Examples of common expressions and abbreviations
3 g; 18 mm; 300 m^2; 4 Mar 1983; 27%; 50 five-day old plants; 1.6 million; 23 ug; 5°C; 1980/81 season; 1980-82 seasons; Fig.; No.; FAO;USA. Fertilizers: 1 kg N or P_2O_5 or K_2O/ha.
Mon, Tues, Wed, Thurs, Fri, Sat, Sun; Jan, Feb, Mar, Apr, May, June, July, Aug, Sept, Oct, Nov, Dec.
Versus = vs, least significant difference = LSD, standard error = SE ±, coefficient(s) of variation = CV(s). Probability: Use asterisks to denote probability * = P<0.05; ** = P<0.01; *** = P<0.001.

Botanical: Include the authority name at the first mention of scientific names. Cultivar(s) = cv(s), variety = var(s), species = sp./spp., subspecies = subsp., subgenus = subg., forma = f., forma specialis = f. sp.

References
Journal articles: Khalil, S. A. and Harrison, J.G. 1981. Methods of evaluating faba bean materials for chocolate spot. FABIS No. 3: 51-52.

Books: Witcombe, J. R. and Erskine, W. (eds.). 1984. Genetic resources and their exploitation-chickpea, faba beans, and lentils. Advances in Agricultural Biotechnology. Martinus Nijhoff/Dr. W. Junk Publishers, The Hague, The Netherlands, 256 pp..s 1;*Articles from books*: Hawtin, G. C. and Hebblethwaite, P. D. 1983. Background and history of faba bean production. Pages 3-22 *in* The Faba Bean (*Vicia faba* L.) (Hebblethwaite, P.D., ed.). Butterworths, London, England.

Papers in Proceedings: Hawtin, G. C. 1982. The genetic improvement of faba bean. Pages 15-32 *in* Faba Bean Improvement: Proceedings of the Faba Bean Conference (Hawtin, G. and Webb, C., eds.). ICARDA/IFAD Nile Valley Project, 7-11 Mar 1981, Cairo, Egypt.

Submission of articles
Contributions should be sent to FABIS, Documentation Unit, ICARDA, P.O. Box 5466, Aleppo, Syria.

ANNOUNCEMENTS

اعلانات

The International Pulse Trade Industry Confederation (IPTIC)

The IPTIC was formed about 20 years ago. Its members are involved in the commercialization, processing, and marketing of pulses. Through the Confederation, members protect and promote international trading interests.

Further information about the Confederation may be obtained by writing to:

IPTIC
286 Bourse du Commerce
75040 Paris Cedex 01
FRANCE
(Telephone (33-1) 42.36.84.35.)

Project Identification in Developing Countries

The Institute for Development Policy and Management (IDPM) at the University of Manchester, UK has organized this conference, which will be held 7-11 September 1987 at the University of Manchester.

The objective of the conference is to publicize current ideas on how to identify successful development initiatives, and, by gathering together senior staff members of aid agencies and governments in developing countries, to promote discussion and exchange of experience in this area.

For information write:

Institute for Development Policy and
Management,
University of Manchester,
Crawford House,
Precinct Centre,
Oxford Road,
Manchester M13 9QS,
UK.

Ninth Australian Plant Breeding Conference (APBC), Wagga Wagga, New South Wales, Australia

This conference will be held 27 June-1 July 1988 at the campus jointly occupied by the Agricultural Research Institute and the Riverina-Murray Institute of Higher Education near Wagga Wagga.

The APBC provides a forum for the exchange and discussion of technical information and viewpoints relevant to plant improvement in agriculture, horticulture, and silviculture.

Those involved and interested in any area of plant breeding, from both private and public sectors, are invited to participate in the conference.

For further information write:

Dr. Barbara Read,
Secretary, APBC,
Agricultural Research Institute,
Private Mail Bag,
Wagga Wagga,
NSW 2650,
AUSTRALIA.

Erratum corrigendum

Stringi, L. *et al.* 1986. Effects of plant density on *Vicia faba* L. *equina* and *Vicia faba* L. *minor* in a semi-arid environment in Italy. FABIS Newsletter 15: 42-45.

The second sentence in the second paragraph under Materials and Methods should read,

"For each variety, 20 plant densities were grown (5-100 germinable seeds/m^2 in increments of 5) in a randomized complete block design. Seeds were sown on 11 January 1983 and 16 January 1984 with a row spacing of 70 cm."

BOOK REVIEWS مطالعات في الكتب

The Mineral Nutrition of Higher Plants

Horst Marschner
ISBN 0.12.473540.1
Published by Academic Press, London, 1986.

An understanding of the mineral nutrition of plants is of fundamental importance in both basic and applied botany. This book presents the principles of mineral nutrition in the light of current advances in research on this subject.

The book is divided into two parts. The first part is on nutritional physiology and the main emphasis is on short and long distance transport of mineral elements, source-sink relationships and yield physiology, and on functions of mineral elements. In the second part the main topics are the acquisition of mineral nutrients from soil by the roots and root/soil interactions.

The text is aimed at advanced and graduate students and a basic knowledge of plant physiology, biochemistry, and soil science is assumed.

Hormonal Regulation of Plant Growth and Development

S.S. Purohit (editor).
In Advances in Agricultural Biotechnology Series
Martinus Nijhoff/Dr. W. Junk Publishers 1985.
ISBN 90-247-3198-4.

This book provides a useful review of various hormone-controlled processes within the plant. Contributions have been made by a number of scientists worldwide and include topics such as the molecular basis of hormone action; the effect of hormones in flowering, seed dormancy and germination; enzyme secretion and ion transport; and the importance of ethylene in a number of processes.

Populations of Plant Pathogens. Their Dynamics and Genetics

M.S. Wolfe and C.E. Caten (editors).
Blackwell Scientific Publications 1987.
ISBN 0-632-01433-4
Price: £40.00.

This book arose from a meeting held by the British Society for Plant Pathology at the University of Leeds in December 1983. The three sections in the book cover basic concepts, the dynamics of pathogen populations, and genetic changes in pathogen populations.

A Literature Guide for the Identification of Plant Pathogenic Fungi.

American Phytopathological Society 1987.
ISBN 0-89054-080-2
$ 24 in US, $ 30 elsewhere plus 10% for postage and packaging.
240pp.

This is a valuable guide for those requiring information on fungal disease pathology from the many volumes published on plant pathology. It is divided into two parts. Part 1 gives important references to major groups of plant pathogenic fungi, and alphabetical lists of genera and a guide to relevant literature. Part 2 covers the genera of plant pathogenic fungi.

Need More Information ?

TRAINING OPPORTUNITIES IN FOOD LEGUME IMPROVEMENT AT ICARDA

Food legumes are an important source of protein in the diet of the population in North Africa and West Asia and have a beneficial residual effect on soil fertility. Therefore, research on and production of food legumes are important in this region. However, there is a shortage of trained manpower at all levels of research and extension work.

To help reduce this shortage, the Food Legume Improvement Program (FLIP) at ICARDA offers several training opportunities, some of which are outlined here. In each case scholarships are available but, as these are limited in number, bilateral projects, donor agencies, and governments are encouraged to nominate and finance candidates.

RESIDENTIAL TRAINING COURSE

This course, held annually from March to mid-June at ICARDA's research station near Aleppo, Syria, aims to provide participants with sound technical knowledge, an opportunity to practice new skills, and a stronger science-based understanding of their jobs. It also helps to promote contact and exchange of information and material between ICARDA and national programs.

The course is run by a multidisciplinary team of scientists and covers *breeding, agronomy and crop physiology, statistical methods in agronomy and crop physiology, statistical methods in field experimentation, nutrition, crop protection, mechanization, farming systems*, and *communication*.

Candidates should have a diploma or BSc in agriculture, be currently assigned to a national agricultural research program with a commitment to continue this assignment, and be reasonably proficient in spoken and written English.

For further information and applications, write to the Head of Training, ICARDA, PO Box 5466, Aleppo, Syria.

INDIVIDUAL OPPORTUNITIES

Individual, non-degree training opportunities of different duration are available for nominees from national programs, depending on candidates' needs and academic background, and cropping season.

Candidates are given the opportunity to improve their skills in one or more of the following areas of faba bean, kabuli chickpea, or lentil improvement: *breeding, agronomy and physiology, disease screening techniques* (in the laboratory and field), *quality*, and *insect damage and screening*.

Further information is available from the Head of Training, ICARDA, PO Box 5466, Aleppo, Syria.

MANAGEMENT AND DEVELOPMENT OF NURSERIES

Starting in 1988, opportunities will be available for individual, non-degree training on the management of International Food Legume Nurseries from ICARDA and the development of regional and national nurseries. Skills learned will include *managing a nursery, data collection, analysis and summarization of data*, and *interpretation and report writing*.

Candidates must have at least a BSc in agriculture and be fluent in written and spoken English.

More details are available from the Head of Training, ICARDA, PO Box 5466, Aleppo, Syria.

LOOK IN FABIS 18 FOR FURTHER TRAINING OPPORTUNITIES

A Collaborative International Testing Program for Determinate Growth Habit

A series of determinate mutants are now known in *Vicia faba* and the most recent list is that provided by Ward and Chapman (1986). New mutants continue to accumulate and there is every incentive for agronomists and breeders to identify and perpetuate new determinate types whenever they occur either by natural or induced variation.

Because of the importance of and interest in determinate mutants, the following proposal was adopted at the 4th International *Vicia faba* Cytogenetics Review Meeting held recently in Cyprus.

"Incorporation of determinate growth habit in *Vicia faba*, if it can be accomplished without detriment to yields, is a worthwhile objective since there is the prospect of a more manageable plant type. Not all determinate mutants are equally valuable and their mode of influence upon the plant can vary appreciably from one mutant to another."

Two things were recognized as being of great importance:

i) The systematic collection and description of determinate or ti types as they become available.

ii) From among these types, a representative sample should be chosen for detailed genetic analysis.

It was agreed that to further these objectives there should be a collaborative international project whereby participants would both contribute determinate genetic variants and participate in practical aspects of the crossing program while being able to receive any seed material, and benefit from any resulting advances.

It was also agreed to organize the project from Wye College through the good offices of Dr. Geoffrey Chapman.

Those wishing to participate in the scheme are invited to contact Dr. G.P. Chapman, Wye College, Ashford, Kent, TN25 5AH, UK directly, indicating a) what stocks they have available, and b) the extent of resources they would be able to commit.

Reference

Ward, S. and Chapman, G.P. 1986. Third Conspectus of Genetic Variation within *Vicia faba* 1986. ICARDA, Aleppo, Syria, 54 pp.

Free Catalog of ICARDA Publications
Request your list of all currently available publications from the Scientific and Technical Information Program (STIP).

ICARDA Information Brochure
ICARDA's historical background and research objectives are outlined in English and Arabic. For your copy, contact STIP.

LENS (Lentil Newsletter)
This newsletter is produced twice a year at ICARDA. Short research articles are published and comprehensive reviews are invited regularly on specific areas of lentil research. The newsletter also includes book reviews, key abstracts on lentils, and recent lentil references. For further information write LENS.

RACHIS (Barley, Wheat and Triticale Newsletter)
This ICARDA service is aimed at cereals researchers in the Near East and North Africa region and Mediterranean-type environments. It publishes up-to-the-minute short scientific papers on the latest research results and news items. RACHIS seeks to contribute to improved barley, durum wheat, and triticale production in the region; to report results, achievements, and new ideas; and to discuss research problems. For further information, write RACHIS.

Field Guide to Major Insect Pests of Faba Bean in the Nile Valley (English and Arabic)
This pocket field guide for research and extension workers explains how to identify and control the main insect pests of faba bean in Egypt and Sudan. The distribution, description, and biological characteristics are given for each insect, along with the type of injury, assessment of damage, and recommended control measures. A key to injuries is included. Insects and the damage they cause on faba beans are illustrated with 41 color photos. For your copy, write FLIP.

Field Manual of Common Faba Bean Diseases in the Nile Valley (English and Arabic)

This pocket field manual is a tool for field workers to diagnose and control diseases of faba beans in Egypt and Sudan. Symptoms, development, and control of various diseases are discussed, and symptoms are illustrated with 38 color photos. Also included are rating scales for disease resistance in faba bean lines and a glossary of basic phyto-pathological terms. For your copy, write FLIP.

Field Guide to Major Insect Pests of Wheat and Barley (Arabic)

This field guide in Arabic covers fungal, bacterial, viral, and physiological diseases, as well as insects and nematodes, that attack wheat and barley crops in the Middle East and North Africa. Forty-four insects and diseases are discussed and illustrated with 72 color photos. For your copy, write Cereals Improvement Program.

ICARDA's Food Legume Improvement Program

In English and Arabic, the 24-page illustrated information brochure briefly describes research projects on lentil, faba bean, and chickpea treated either as single crops or as a group. For your copy, write FLIP.

Screening Chickpeas for Resistance to Ascochyta Blight A Slide-tape Audio-tutorial Module

This slide-tape audio-tutorial module is the first in the food legume training series. It is designed for the use of legume trainees during the training courses at ICARDA as well as for scientists and their support staff in the various national programs. This module is also useful educational material for universities and training departments in national research systems. For your copy of this publication or package, write Training Department.

TO OBTAIN PUBLICATIONS:

Address requests for publications to the specific department or service cited above, at: ICARDA, P.O. Box 5466, Aleppo, Syria.

لنس (النشرة العلمية المتخصصة بالعدس)

تصدر ايكاردا هذه النشرة مرتين في العام . وهي تعنى بنشر البحوث العلمية المختصرة كما تدعو بشكل منتظم بعض العلماء للمساهمة بتقديم مقالات رئيسية تتعلق باختصاصات معينة حول بحوث العدس . كما تضم النشرة مراجعات في الكتب وملخصات رئيسية عن العدس اضافة الى المراجع الحديثة المتعلقة به . لمزيد من المعلومات اكتب الى أسرة "لنس " .

راكس (النشرة العلمية المتخصصة بالشعير والقمح والترتيكال)

توجه هذه النشرة الصادرة عن ايكاردا الى علماء الحبوب والمهتمين في منطقة الشرق الادنى وشمال افريقيا والبيئات المناخية المشابهة لحوض البحر الابيض المتوسط . وهي تنشر البحوث المختصرة الحديثة عن آخر ما تمخضت عنه نتائج التجارب بالاضافة الى الاخبار المتعلقة بها . وتسعى راكس الى المساهمة بتحسين انتاجية الشعير والقمح القاسي والترتيكال في المنطقة ، والى نشر نتائج التجارب والانجازات والافكار الجديدة مع طرح مشاكل البحوث . للمزيد من المعلومات يرجى الكتابة الى " راكس " .

الدليل الحقلي للافات الحشرية الرئيسية على الفول في وادى النيل (بالانكليزية والعربية)

هذا الدليل الحقلي ــ وهو بحجم الجيب ــ موجه للباحثين والمرشدين الزراعيين ، ويشرح كيفية الكشف عن اهم الافات الحشرية للفول في مصر والسودان وطرق مكافحتها ويقدم وصفا دقيقا عن كل حشرة وتوزعها وصفاتها الحيوية فضلا عن نوعية الضرر الذى تحدثه وتقديره ، واجراءات المكافحة الموصى بها . كما يتضمن مفتاحا لتحديد الاصابة . وثمة 41 صورة ملونة عن الحشرات والاضرار التي تلحقها بالفول . للحصول على نسختك يرجى الكتابة الى برنامج تحسين البقوليات الغذائية (FLIP) .

الدليل الحقلي لامراض الفول في وادى النيل (بالانكليزية والعربية)

يعتبر هذا الدليل الحقلي ــ وهو بحجم الجيب أيضا ــ اداة هامة للعاملين في الحقول لتشخيص الامراض التي تصيب الفول في مصر والسودان وطرق مكافحتها . ويبحث بالتفصيل اعراض وتطور امراض مختلفة وطرق مكافحتها ، وفيه38 صورة ملونة توضح اعراض الاصابة . كما يضم الدليل مقياسا لمقاومة الامراض في سلالات الفول،وقائمة ببعض المصطلحات العلمية الاساسية لعلم أمراض النبات . للحصول على نسختك يرجى الكتابة الى برنامج تحسين البقوليات الغذائية (FLIP)

الدليل الحقلي لاهم آفات القمح والشعير (باللغة العربية)

يغطي هذا الدليل الحقلي الامراض الفطرية والبكتيرية والفيروسية والفيزيولوجية بالاضافة الى الحشرات والديدان الثعبانية (النيماتودا) التي تصيب محاصيل القمح والشعير في الشرق الاوسط وشمال افريقيا . ويبحث في اربعة واربعين مرضا وحشرة ، ويحتوى على 72 صورة ملونة . للحصول على نسختك يرجى الكتابة الى برنامج تحسين محاصيل الحبوب .

برنامج تحسين البقوليات الغذائية في ايكاردا

صدر هذا الكتيب باللغتين الانكليزية والعربية،ويتألف من 24 صفحة،وهو يصف باقتضاب مشاريع البحوث الجارية على العدس والفول والحمص كمحاصيل منفصلة أو كمجموعة ــ اطلب نسختك من برنامج تحسين البقوليات الغذائية .

غربلة الحمص لصفة المقاومة لمرض التبقع الاسكوكيتي وشرائح سمعية ــ بصرية للتعليم

هذه الشرائح السمعية ــ البصرية تعتبر الاولى من نوعها ضمن سلسلة التدريب في برنامج البقوليات الغذائية . وهي مخصصة للمتدربين الملتحقين بدوراتهم التدريبية على البقوليات في ايكاردا ، بالاضافة الى العلماء وزملائهم في البرامج الوطنية المختلفة . وتعتبر هذه الشرائح كمادة تعليمية مفيدة بالنسبة للجامعات واقسام التدريب لدى برامج البحوث المختلفة . وللحصول على نسختك من هذه المطبوعة او المجموعة يرجى الكتابة الى قسم التدريب .

فرص التدريب وبحوث ما بعد التخرج في ايكاردا

توفر ايكاردا دورات تدريبية نشيطة تتعلق بتطوير وتحسين محاصيل البقوليات الغذائية والحبوب والاعلاف وذلك من خلال خبراء المركز والمدربين الحاذقين في البرامج الرئيسية . وللحصول على كراس كامل حول فرص التدريب في ايكاردا يرجى الكتابة الى قسم التدريب .

للحصول على منشورات المركز

يرجى توجيه مراسلاتكم بشان طلب المطبوعات المذكورة اعلاه الى الاقسام أو البرامج المعنية المذكورة آنفا في ايكاردا ص.ب. 5466 حلب ــ سورية .

للمزيد من المعلومات

فرص التدريب لدى برنامج تحسين البقوليات الغذائية في ايكاردا

تعتبر البقوليات الغذائية مصدرا هاما للبروتين في غذاء شعوب شمال افريقيا وغرب آسيا فضلا عن تأثيرها المتبقي المفيد في تحسين خواص التربة . لذا فان اجراء البحوث حول انتاجية البقوليات يعتبر على درجة من الاهمية في المنطقة الا أن هناك نقصا في الكودار المدربة على جميع مستويات البحث واعمال الارشاد الزراعي .

وبغية العمل على تلافي هذا النقص فان برنامج تحسين البقوليات الغذائية (FLIP) في ايكاردا يقدم عدة فرص تدريبية نعرض لبعض منها هنا. وفي كل من هذه الدورات تقدم بعض المنح الدراسية ولكن نظرا لكونها محدودة العدد ، فان المشاريع الثنائية والوكالات المانحة والحكومات تشجع على تسمية المرشحين وتقديم العون المالي لهم .

الدورة التدريبية الطويلة

هذه الدورة تعقد سنويا من آذار/مارس الى منتصف حزيران/يونيو في محطة بحوث ايكاردا قرب مدينة حلب بسورية ، وتهدف الى تزويد المشاركين بالمعلومات الفنية الصحيحة ومنحهم فرص ممارسة مهارات جديدة وفهم اكثر عمقا لاعمالهم على اساس علمي سليم . كما انها تساعد على تقوية الصلات وتبادل المعلومات والبذور وغيرها بين ايكاردا والبرامج الوطنية .

ويقود الدورة فريق من العلماء المختصين في علوم مختلفة تغطي : تربية النبات والمعاملات الزراعية وفيزيولوجيا المحاصيل والطرق الاحصائية المتبعة في المعاملات الزراعية وفيزيولوجيا المحاصيل والطرق الاحصائية في التجارب الحقلية والتغذية ووقاية النبات والمكننة والنظم الزراعية والاتصالات .

ويجب أن يكون المرشحون من الحاصلين على دبلوم أو على درجة الاجازة في العلوم الزراعية ، وان يكونوا عاملين في أحد برامج البحوث الزراعية الوطنية مع الالتزام بالاستمرار في عملهم وأن يتقنوا اللغة الانكليزية محادثة وكتابة .

ولمزيد من المعلومات وتقديم الطلبات يرجى الكتابة الى رئيس قسم التدريب ، ايكاردا ، ص.ب. 5466 حلب – سورية .

فرص التدريب الفردى

تتوفر الدورات الفردية غير التأهيلية (أى بدون درجات علمية) في فترات مختلفة للمرشحين من البرامج الوطنية حسب احتياجات المرشحين وخلفيتهم العلمية والموسم الزراعي .

وفيها يمنح المرشحون الفرصة لتحسين مهاراتهم في واحدة أو اكثر من المجالات المتعلقة بالفول والحمص الكابولي وتحسين العدس وهي : التربية والمعاملات الزراعية والفيزيولوجيا وتقنيات الغربلة للامراض (في المختبر والحقل) والجودة والضرر الذى تلحقه الحشرات والغربلة .

لمزيد من المعلومات يرجى الاتصال برئيس قسم التدريب ، ايكاردا ، ص.ب. 5466 حلب ، سورية .

ادارة المشاتل وتطويرها

اعتبارا من عام 1988 ستتوفر فرص للتدريب الفردى غير التأهيلي على ادارة المشاتل الدولية للبقوليات الغذائية في ايكاردا وتطوير المشاتل الاقليمية والمحلية ، وجمع البيانات ، وتحليل النتائج وتلخيصها وتفسيرها وكتابة التقارير عنها .

ويجب أن يكون المرشحون من الحاصلين على درجة الاجازة في العلوم الزراعية على الاقل وأن يتقنوا اللغة الانكليزية قراءة وكتابة .

لمزيد من التفاصيل يرجى الكتابة الى رئيس قسم التدريب ، ايكاردا ص.ب. 5466 حلب ، سورية .

كتالوج مجاني عن مطبوعات ايكاردا

اطلب قائمتك من جميع المطبوعات المتوفرة حاليا في ايكاردا من برنامج المعلومات العلمية والفنية (STIP)

كتيب اعلامي عن ايكاردا

وهو يشرح تاريخ انشاء المركز والاهداف التي يتوخاها من البحوث الجارية . وقد صدر باللغتين الانكليزية والعربية. للحصول على نسختك اتصل ببرنامج المعلومات العلمية والفنية .

MEETING REPORTS

The First International Food Legume Research Conference (IFLRC), 6 - 11 July 1986, Spokane, Washington, USA.

The first International Food Legume Research Conference (IFLRC), attended by 500 delegates from 48 countries, was held 6-11 July 1986 at the Sheraton Hotel, Spokane, Washington, USA. It was supported by a number of benefactors including USAID, IDRC, ICARDA, ICRISAT, FAO, USDA, ODA, and ADPLA. The conference, which was organized by an organizing committee in consultation with an International Advisory Board and International Observer, aimed to promote collaboration and exchange of scientific and technical information worldwide on research related to pea (*Pisum sativum*), lentil (*Lens culinaris*), faba bean (*Vicia faba*), and chickpea (*Cicer arietinum*). The conference also provided an international forum for discussion of research priorities and aimed to maximize awareness and use of novel technology and research methods, encourage evaluation of new technology on farmers' fields and adoption of alternatives to traditional methods, and promote links between and within national and international institutions.

There were over 100 invited papers from some 250 scientists covering such topics as germplasm resources, breeding, biotechnology, tillage and systems management, pests and diseases, and economic aspects as well as complementary workshops and discussion forums on topical subjects such as rhizosphere ecology, seed pathology, and systems for the integration, dissemination, and retrieval of information. Abstracts of invited contributions (2) and the 200 or so contributed posters (1) have already been published and the proceedings (World Crops: Cool Season Food Legumes, edited by R.J. Summerfield and published by Martinus Nijhoff) should be available by the end of 1987.

A number of business meetings were also held, at which members discussed a formal structure for the continuation of the IFLRC in future and the criteria and objectives for subsequent conferences. As a result of these meetings, an International Steering Committee was formed of representatives from ICARDA and ICRISAT, the Chairperson and Programme Chairperson of the last IFLRC, a host-country Chairperson, and a representative from each of six ecogeographical regions. The regional representatives are: for North America, A.E. Slinkard; for Latin America/Caribbean, M.E. Tapia; for Europe, R.J. Summerfield; for Africa, A. Telaye; for the Near East, A.M. Nassib; and for Asia and the Pacific, W.A. Jermyn and B.A. Malik.

The organizers plan to hold the conference every 4-5 years and hope that the next meeting will be held in a developing country. For more details readers should contact A.E. Slinkard, Crop Development Centre, University of Saskatchewan, Saskatoon, Canada.

REFERENCES

(1) Summerfield, R.J. (ed.). 1986. Abstracts of the International Food Legume Research Conference on Pea, Lentil, Faba Bean, and Chickpea. Martinus Nijhoff, The Netherlands. 108 pp.

(2) O'Keefe, L.E. and Muehlbauer, F.J. (eds.). 1986. International Food Research Conference: Contributed Posters. University of Idaho Press.

تقارير المؤتمرات

المؤتمر الدولي الاول حول بحوث البقوليات الغذائية
9-11 تموز/يوليو 1986 ، سبوكان ، واشنطن .

عقد المؤتمر الدولي الاول حول بحوث البقوليات الغذائية (IFLRC) في فندق شيراتون بسبوكان واشنطن في الولايات المتحدة الاميركية خلال الفترة من 6-11 تموز/يوليو 1986 وحضره 500 باحث يمثلون 48 بلدا . وقد ساهمت عدة جهات في دعم المؤتمر من بينها الوكالة الاميركية للتنمية الدولية (USAID) ومركز بحوث التنمية الدولية (IDRC) ، والمركز الدولي للبحوث الزراعية في المناطق الجافة (ICARDA) والمعهد الدولي لبحوث محاصيل المناطق الاستوائية شبه القاحلة (ICRISAT) ومنظمة الاغذية والزراعة للامم المتحدة (FAO) ووزارة الزراعة الاميركية (USDA) وادارة التنمية لما وراء البحار (ODA) والهيئة الاميركية للبازلاء الجافة والعدس (ADPLA) وكان المؤتمر الذى نظمته لجنة منظمة بالتشاور مع مجلس استشارى دولي ومراقب دولي يهدف الى تعزيز التعاون وتبادل المعلومات العلمية والفنية على مستوى العالم حول البحوث المتعلقة بالبازلاء (Pisum sativum) والعدس (Lens culinaris) والفول (Vicia faba) والحمص (Cicer arietinum) . وكان المؤتمر بمثابة محفل دولي بحثت فيه اولويات البحوث بهدف زيادة الوعي واستخدام التقنيات الحديثة في حقول المزارعين وتبني بدائل عن الطرق التقليدية وتعزيز الروابط ضمن المؤسسات الوطنية والدولية وفيما بينها .

وكان هناك أكثر من 100 بحث من حوالي 250 باحث تناولت موضوعات مختلفة مثل مصادر الاصول الوراثية والتربية والتكنولوجيا الحيوية والفلاحة ونظم الادارة والاوبئة والامراض والنواحي الاقتصادية بالاضافة الى عقد حلقات دراسية مكملة ومحافل لمناقشة الموضوعات ذات الاهمية مثل بيئة المجموع الجذرى ، وامراض البذور والانظمة المتعلقة بتكامل تبادل واسترجاع المعلومات .وقد نشرت ملخصات عن البحوث المدعوة (1) مع 200 ملصق (2) ومن المزمع اصدار وقائع المؤتمر مع نهاية 1987 في كتاب : (World crops : Cool Season Food Legumes, edited by R.J. Summerfield and published by Matinus Nijhoff).

كما عقد عدد من اجتماعات العمل التي ناقش الاعضاء فيها البنية الرسمية لاستمرار عقد المؤتمرات الدولية حول بحوث البقوليات الغذائية في المستقبل ومعايير واهداف المؤتمرات اللاحقة . وقد نجم عن تلك الاجتماعات تشكيل لجنة توجيهية من ممثلين عن كل من ايكاردا واكريسات ورئيس برنامج المؤتمر الدولي حول بحوث البقوليات الغذائية الاخير ، ورئيس من البلد المضيف وممثل عن كل من المناطق البيئية والجغرافية الست . والممثلون الاقليميون هم : أ. اى سلينكارد ، عن أمريكا الشمالية ، م.ى. تابيا عن أمريكا اللاتينية والبحر الكاريبي ، ور.ج. سمرفيلد عن اوروبا وآ. تلاى عن افريقيا ، وآ.م. نصيب عن الشرق الادنى ، وآ. جيرمين وب.T. مالك عن آسيا والمحيط الهادى .

وينوى المنظمون عقد المؤتمر كل 4-5 سنوات ويأملون بعقد المؤتمر الثاني في احدى البلدان النامية . ولمزيد من التفاصيل يرجى الاتصال ب :

A.E. Slinlcard, Crop Development Center, University of Saskatchewan, Sakatoon, Canada.

المراجع

(1) Summerfield, R.J. (ed.). 1986. Abstracts of the International Food Legume Research Conference on Pea, Lentil, Faba Bean, and Chickpea. Martinus Nijhoff, The Netherlands. 108 pp.

(2) O'Keefe, L.E. and Muehlbauer, F.J. (eds.). 1986. International Food Research Conference: Contributed Posters. University of Idaho Press.

DOCUMENT COLLECTION

With the financial support of the International Development Research Centre (IDRC), ICARDA is building up its document collection on faba bean. The collection will be used to supply needed documents to scientists in developing countries.

We would be grateful if readers who have any relevant documents would send them to:

FABIS
ICARDA
Box 5466
Aleppo, Syria

ARE YOU MOVING ?

If you are moving, please let us know your new address as soon as possible. Send it to:

FABIS
ICARDA
Box 5466
Aleppo, Syria

اعلان الى العلماء والباحثين العرب الكرام

يسر المركز الدولي للبحوث الزراعية في المناطق الجافة (ايكاردا) ، اعلامكم بان مركز بحوث التنمية الدولية (IDRC) في أوتاوا ـ كندا،قد وافق على تقديم دعم مالي لمشروع فابس FABIS مدته ثلاث سنوات اعتبارا من بداية عام 1987 ولغاية 1989 • ويحيطكم علما بان ادارج اللغة العربية ضمن النشرة الاخبارية للفول يشكل أحد أهم أهداف هذا المشروع •

وبمزيد من السرور تعلن اسرة تحرير " FABIS " للباحثين العرب العاملين في مجال تحسين محصول الفول ، انها ستبدأ اصدار نشرتها العلمية باللغتين العربية والانكليزية بدءا من هذا العام 1987 • لذا فيرجى من الاخوة العلماء الراغبين في نشر بحوثهم باللغة العربية التفضل بارسالها الى العنوان التالي : مجلة " فابس " ، ايكاردا ـ قسم التوثيق ، ص•ب• 5466 حلب ـ سورية

ملاحظة :

تتم كتابة البحث بلغة عربية واضحة ، وفق الترتيب التالي :

1) الملخص ويكتب باللغتين العربية والانكليزية •
2) المقدمة •
3) المواد والطرق •
4) النتائج •
5) المناقشة ويمكن دمجها مع النتائج وتصبح (نتائج البحث والمناقشة) •
6) المراجع •

المعاملات الزراعية والمكننة

الفيزيولوجيا وعلم الاحياء

التربية والوراثة

فابس

مشروع المعلومات المتخصصة عن الفول

فابس ، نشرة علمية 17 ، نيسان/ابريل 1987

المحتويات

Ar

ايكاردا والمجموعة الاستشارية للبحوث الزراعية الدولية

يتمثل الهدف العام للمركز الدولي للبحوث الزراعيه في المناطق الجافه (ايكاردا) في زيادة الانتاجية الزراعية والموارد الغذائية المتاحة في المناطق الريفيه والحضرية بهدف تحسين الوضع الاجتماعي والاقتصادي لشعوب البلدان النامية وخاصة في شمال افريقيا وغرب آسيا . وتركز ايكاردا اهتماماتها بصورة رئيسية على المناطق التي تعتمد في زراعتها على الامطار الشتوية والتي تتراوح فيها الهطولات السنوية من 200 - 600 مم . وعندما تستدعي الضرورة ستمتد دائرة بحوثها لتغطي مناطق ببئية مروية او ذات أمطار موسمية .

ويضطلع المركز بمسؤولية عالمية في تحسين الشعير والعدس والفول ، وبمسؤولية اقليمية في تحسين القمح والحمص والنظم الزراعية والثروة الحيوانية والمراعي والمحاصيل العلفية . كما ويعتبر تدريب وتأهيل الباحثين الزراعيين في البلدان النامية وتبادل نتائج البحوث معهم أحد أهم الانشطة التي تقوم بها ايكاردا .

وقد ساهمت المجموعة الاستشارية للبحوث الزراعية الدولية (CGIAR) بتاسيس ايكاردا في سورية عام 1977 كمركز للبحوث لايتوخى الربح . أما المجموعة الاستشارية للبحوث الزراعية الدولية فهي هيئة غير رسمية من المتبرعين تضم حكومات ومنظمات ومؤسسات خاصة ، وتدعم البحوث الزراعية في جميع انحاء العالم بهدف تحسين الانتاج الغذائي في البلدان النامية ، وذلك من خلال شبكة مؤلفة من ثلاثة عشر مركزا دوليا للبحوث من بينها ايكاردا . وتغطي أعمال الشبكه بحوثا على أنظمة المحاصيل والمواشي التي تسهم في تأمين ثلاثة ارباع الغذاء في البلدان النامية .

فابس

تصدر ايكاردا نشرة " فابس FABIS " العلمية ثلاث مرات في السنة بدعم مالي من مركز بحوث التنمية الدولية (IDRC) ، في اوتاوا بكندا وفابس هي نشرة علمية متخصصة بالفول ، وتعتبر وسيلة اتصال لتبادل نتائج البحوث حول هذا النبات وتضم النشرة بحوثا مختصرة تهدف الى ايصال المعلومات بسرعة ، اضافة الى بعض المقالات الشاملة التي تدعو اليها أسرة النشره بشكل منتظم وتتناول مجالات معينة من بحوث الفول ، كما تضم النشرة بعض الاعلانات . وهذه النشرة تقدم المعلومات حول بحوث الفول دون مقابل من خلال قسائم الاستجواب والنسخ المصورة والاستقصاء عن مجموعة الوثائق المتعلقة بالفول .

آخر موعد لاستلام اسهامات القراء لعدد فابس رقم 18 هو 30 حزيران/يونيو ، ولعدد 19 تاريخ 31 تشرين الاول/اكتوبر 1987 ولعدد 20 هو 28 شباط/فبراير 1988 .

الاشتراكات

توزع نشرة " فابس " العلمية دون مقابل للباحثين المعنيين بنبات الفول . وللاشتراك فيها يرجى الكتابة الى :

FABIS/Documentation Unit/ICARDA, P.O.Box 5466
Aleppo, Syria

لجنة تنسيق فابس

كندا : الدكتور س. برنييه ، قسم علوم النبات ، جامعة مانيتوبا ، وينبج ، مانيتوبا R3T 2N2
مصر : الدكتور عبد الله نصيب ، معهد المحاصيل الحقلية ، مركز البحوث الزراعية ، الجيزة 12619
اليابان : الدكتور ك. كوجر ، كلية الزراعة ، جامعة كاجاوا 2393 Ikenobe. Miki-tyo. Kagawa-Ken
السودان : الدكتور ف. آ. صالح ، هيئة البحوث الزراعية ، محطة بحوث شمباط ، ص.ب. 30 خرطوم شمال .
سورية : الدكتور م. ساكسينا ، برنامج تحسين البقوليات الغذائية ، ايكاردا ، ص.ب. 5466 ، حلب .
البرازيل : الدكتور هـ. ايدار ، المركز الوطني لبحوث الرز والفاصولياء BR-153. km 4-Gionia/Anapolis
Caixa Postal 179. 74.000-Goiania. Goias
فرنسا : الدكتور ج. بيكارد, 4 Rue du 8 Mai. 36. 100 Neuvy-Pailloux .
ايطاليا : البروفسور سي دو باتشه ، معهد البيولوجيا الزراعية ، جامعة توشيا ، فيتربو .
اسبانيا : الدكتور ج.ى. كوبيرو ، المدرسة الفنية العليا للهندسة الزراعية ، قسم الوراثة ، ص.ب. 3048 ، قرطبة .
المملكة المتحدة : الدكتور د. آ. بوند ، معهد تربية النبات ، ماريس لين ، ترومبنيجتون ، كامبريدج .

فريق اعداد فابس

الدكتور موهان ساكسينا /محرر علمي
الدكتور حبيب ابراهيم /مساعد محرر علمي
السيد نهاد مليحه والسيدة فيونا طومسون /محرران
السيدة مليكه عبد العالي مارتيني /مساعدة
الدكتور وليد سراج والسيد خالد الجبيلي /الملخصات العربية

فابِسْ

نشرة علمية متخصصة بالفول

العدد 17 نيسان/ابريل 1987

المركز الدولي للبحوث الزراعية في المناطق الجافة
ايكاردا
ص. ب. 5466 ، حلب ، سورية