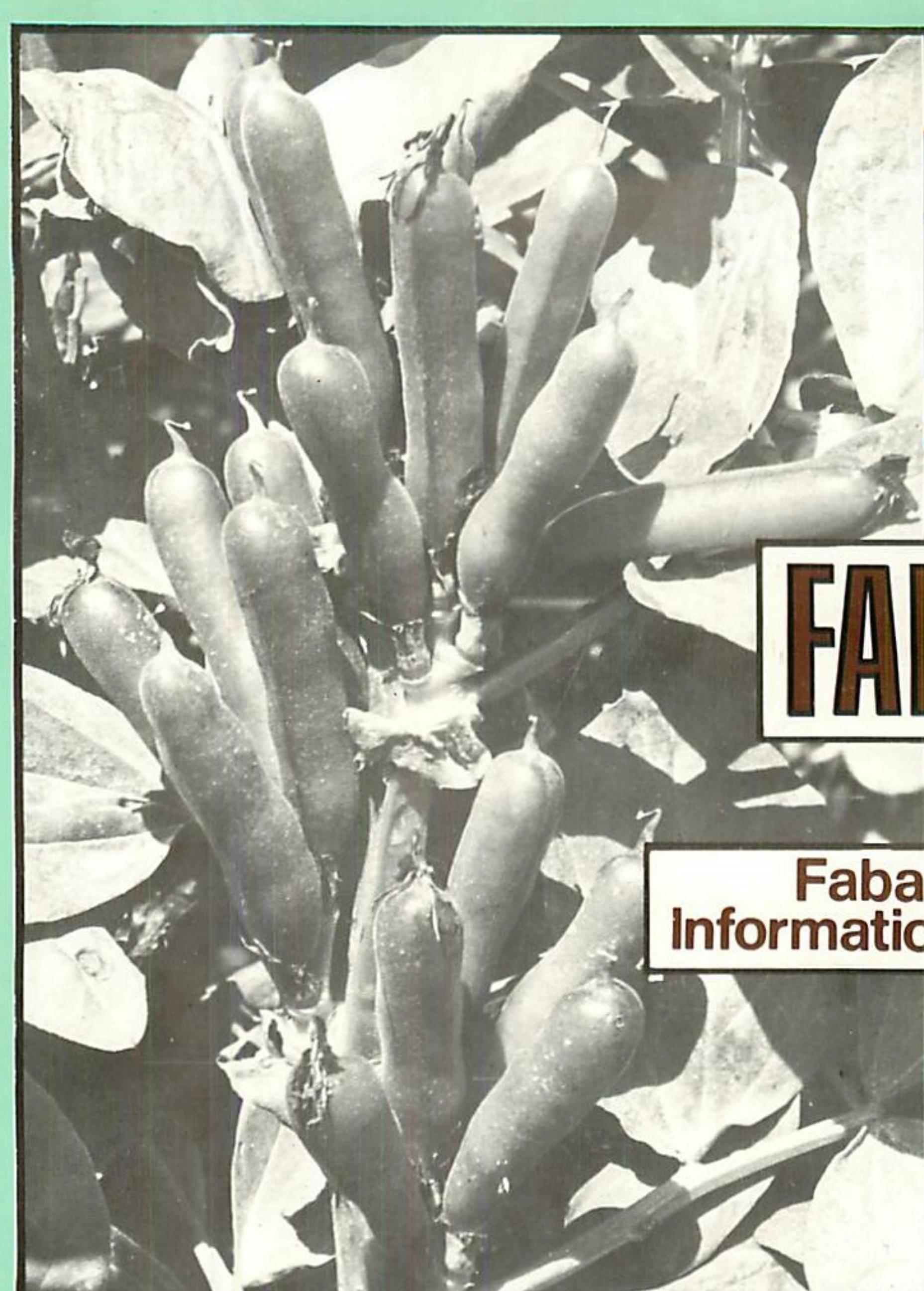

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Faba Bean Information Service

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THE INTERNATIONAL CENTER FOR AGRICULTURAL RESEARCH IN THE DRY AREAS

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GENERAL ARTICLES

SOME ANTI–NUTRITIVE FACTORS IN *VICIA FABA*

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Although the grain legumes represent a potentially excellent source of plant protein for both the animal feed and protein extraction industries, they have been endowed with the capacity to synthesise various compounds which may be toxic to both animals and man. The effects of these compounds appear to be less acute in faba beans than in many other grain legumes and normally have been found to manifest themselves as reductions in growth rate or in food conversion efficiencies as compared with those predicted solely on the basis of either protein content or amino acid composition.

The major anti-nutritive factor responsible for the observed reduction in nutritive value of faba beans seems at present not to have been clearly identified. However, a wide range of potentially toxic compounds have been found in the faba bean including protease inhibitors and polyphenols, both of which to varying degrees have the ability to adversely affect the availability and utilisation of faba bean protein; and also phytic acid, which may significantly reduce the availability of various nutritionally essential trace and macro elements.

Protease inhibitors

Trypsin inhibitors, which were first discovered in soya bean by Read and Haas (1938) have been found to be widely distributed throughout the grain legumes. Those that have been isolated and characterised have been found to be small proteins of low molecular weight and usually rich in the sulphur amino acids. The nutritive significance of these compounds has been reviewed by Liener and Kakade (1969) and although much work has been published on the role of inhibitors in soya bean in reducing animal performance, their mode of action *in vivo* has not been completely elucidated. It has however, been suggested that the retarded growth rates are due not only to decreased intestinal proteolytic enzyme activity but also, since protease inhibitors also induce pancreatic hypertrophy, the growth depression may be due to the increased secretory activity of the pancreas. This would result in an increased production of all pancreatic enzymes, which are particularly rich in the sulphur amino acids and thereby increasing the overall demand for methionine and cystine, thus increasing the minimum sulphur amino acid requirements of the animal.

The existence of protease inhibitors in faba beans was not realised until comparatively recently. Early investigations by Borchers and Ackerson (1947) revealed no trace of inhibitory activity, but Learmouth (1958) reported the presence of proteolytic inhibitors in the germ of *Vicia faba*. Later research activities confirmed their presence (Wilson *et al.*, 1972) and indeed a number of trypsin inhibitors have since been isolated and characterised by a number of workers including Warsy, Norton and Stein (1974). An examination of the variation in trypsin inhibitor activity in a wide variety of differing genotypes, varieties and populations has been reported by both Bhatty (1974) and Griffiths (1979). Both found a two fold range of variation but none of the values found approached those for soya bean. For comparison, typical values for trypsin inhibitor content for a faba bean variety compared with those of peas are given in Table 1. Units used are the quantity of the given species or variety required to contain a similar amount of trypsin inhibitor to 1 g of soya bean

Also included in Table 1 are values for chymotrypsin inhibitor content but again for faba beans the levels found were considerably lower than for soya bean. It was, however, of interest to note that peas appear to contain significantly more chymotrypsin inhibitor than faba beans, the levels for the former approaching these found in soya bean.

Table 1. Comparison of the trypsin and chymotrypsin inhibitor content of various grain legumes.

Species	Variety	Trypsin inhibitor (soya bean equiv.)*	Chymotrypsin inhibitor (soya bean equiv.)*
Faba beans	Dacre	20	20
Peas	Rosakrone	23	3
Soya bean	Cg 36	1	1

* Quantity of given variety required to contain the equivalent amount of inhibitor as 1 g soya bean.

The results of feeding purified faba bean trypsin inhibitor to rats (Abbey, Neale and Norton, 1979) revealed that, at the levels commonly found in faba bean varieties, no statistically significant decreases in growth parameters could be detected. Consequently it would appear unlikely that any significant increase in nutritive value would result in selecting for varieties with decreased proteolytic enzyme inhibitor activity. In addition, Griffiths (1979) found no positive correlation between crude protein content and enzyme inhibitor activity and it would appear, therefore, *unlikely* that any increases in nutritive value obtained through the selection of high protein lines would be seriously diminished by any corresponding major increase in proteolytic enzyme inhibitor content.

Tannins

Polyphenolic compounds, such as the condensed tannins, have been found to be fairly widespread throughout the plant kingdom and their nutritional significance stems from their ability to interact and combine with proteins and other macro-molecules, thus rendering unavailable to the animal a proportion of ingested dietary protein and other nutritionally essential compounds.

The presence of tannins in the seed coat of faba beans has been demonstrated by several workers including Picard (1963) and Bond (1976). All found that high tannin content appeared to be linked with coloured flower varieties, whilst totally white flowered varieties were devoid of any tannin content. The *in vitro* digestibility of various seed coats was determined by Bond (1976) who reported a far higher digestibility for those from white flowered varieties. These results were confirmed by Griffiths and Jones (1977), who also showed that the seed coat tannins inhibited the activity of both fungal and rumen cellulases. Further *in vitro* studies using commercial digestive enzyme preparations (Griffiths, 1979) indicated that seed coat extracts from coloured varieties also inhibited lipase, trypsin and α-amylase activities. It is therefore probable that the protease inhibitor reported to be present in faba bean testa (Wilson *et al.*, 1972) was not a specific protease inhibitor but a more general enzyme inhibitor such as tannin. Martin-Tanguy, Guillaume and Kossa (1977) found that faba bean tannins adversely affected duckling growth, egg production in poultry and nitrogen digestibility. Similar results were reported in a comparison of rats fed diets containing testa from either a coloured or white flowered variety (Moseley and Griffiths, 1979). The rats on the tannin-containing diet (i.e. those receiving testa from a coloured flower variety) gave statistically significant decreases in liveweight gain, net protein utilisation and in the apparent digestibilities of dry-matter, crude protein, soluble carbohydrates and lipids. Studies of the digestive enzyme activities of those same rats (Griffiths and Moseley, 1980) revealed that the activities of both trypsin and α-amylase were reduced in the digestive tracts of those rats receiving the high tannin diets, indicating that the observed reduction in nutritive value was due not only to the formation of unavailable dietary-protein complexes but also due to the inhibition of digestive enzymes *in vivo*. It would therefore appear that at least a part of the reduction in nutritive value of the crop may be attributed to the presence of condensed tannins.

Phytates

Elemental analysis (Clarke, 1970) would suggest that, with the possible exceptions of calcium and manganese, faba beans contain sufficient quantities of trace and macro-elements to meet the minimum requirements of both pigs and poultry.

However, a detailed examination of the phosphorus content (Griffiths and Thomas, 1981) revealed that between 40-55% of the total phosphorus is present in the form of phytate, the mixed calcium and magnesium salts of myo-inositol 1, 2, 3, 4, 5, 6 - hexakis dihydrogen phosphate (Table 2). This would imply that a large proportion of the total phosphorus found in the faba bean is potentially unavailable to the animal. Indeed since these phosphorus rich compounds may also form insoluble chelates with other nutritionally essential metal ions, the availability of other trace and macro-elements such as zinc, iron and calcium may be adversely affected.

Table 2. The phytic acid, total- and phytate phosphorus content of various faba bean varieties.

Variety	Phytic acid (g/100 g)	Total phosphorus (g/100 g)	Phytate phosphorus (g/100 g)
Minor	0.99	0.71	0.28
Maris Bead	1.04	0.61	0.29
Wierboon	0.93	0.46	0.26
Kristal	0.90	0.51	0.25
Minica	0.80	0.42	0.22

The importance of phytates in the commercial production of animal feed would be expected to be comparatively small since supplementation with minerals is common practice. However, in the case of the production of protein isolates, which are most economically prepared by air classification, the phytate content of the protein rich fraction may contain up to 4% phytate (Jonas, 1980). Consequently, since supplementation with minerals is not considered practical on the grounds of both processing and palatability, a high concentration of phytate in faba beans could seriously limit its potential value as a source of protein isolate for human consumption.

Preliminary investigations (Griffiths and Thomas, 1981; Griffiths, 1982) have revealed the existence of considerable variation in phytate content both within and between faba bean varieties, but in view of the possible importance of these compounds on seed and plant physiology further investigations are required before any real attempt at selecting for varieties with a reduced phytate content could be considered practicable.

Other factors

In addition to the three classes of compounds discussed above, the faba bean is known to contain many other nutritionally undesirable compounds such as vicine and convicine, both of which have been linked with favism (Mager, Rozin and Hershko, 1969), phytohaemagglutinins (De Muelenaere, 1965) and an anti-niacin factor (Guillaume, 1977).

Conclusion

It would appear that the faba bean contains a wide and diverse group of anti-nutritional factors, some of which (such as the tannins), could be eliminated by selective breeding programmes. Nutritionally it would appear desirable if some or preferably all of those could be eliminated but since many of these may also play vital roles in natural plant defence mechanisms and in the physiology of the developing plant and seed it is clear that more basic research is required to elucidate the role of these compounds in both plants and animals.

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SHORT COMMUNICATIONS
General

CONSUMER PREFERENCES FOR FABA BEANS IN SELECTED URBAN AND FARMING AREAS OF SUDAN

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Introduction

A survey of consumers in two urban areas and two faba bean producing areas in Sudan was conducted in March-April 1982 (Ali and Ali, 1982; Ali, Salkini and Nordblom 1982). A total of 211 people were questioned about the food consumption patterns of their households and their food preferences. The questions focused largely on the role of faba beans in household diets and in expenditures for food. Explored are hypotheses that (1) faba bean consumption patterns vary between urban and rural areas, and (2) urban dwellers consume more faba beans than people in the farming areas.

Methods

A standard questionnaire, in Arabic, was administered by personal interviews. Households were selected with the aim of representing most residential areas in each study location. The sample in urban areas was comprised of 88 households in Khartoum and 23 in Atbara. The sample in the rural areas included 100 households, 50 each in Zeidab and Aliab. The majority of urban households in the sample were headed by government workers. Farmers and, to a lesser degree, merchants and government workers, headed most of the households sampled in the farming areas.

Results

A common pattern for both farming and urban areas is that faba bean dishes are consumed mainly at the morning and evening meals and very rarely at mid-day (Table 1). Rural households often consume faba beans alone while urban households more often reported combining them with other foods, e.g., cheese, eggs and salad. Households in the urban areas commonly consume faba beans every day of the week while those in the rural areas reported eating them less frequently (Table 2, A).

Table 1. Main foods in three meals of the day (percent of households in each sample area)[1]

	Farming Areas			Urban Areas			
	Al	Z	Al+Z	K	At	K+At	Total Sample
A. Breakfast							
Only F.B. (= faba bean)	64	28	46	11	13	12	28
F.B. + others (mainly F.B.)	2	10	6	64	83	68	39
Others + F.B.	6	16	11	24	4	19	16
Milk only	16	24	20	0	0	0	9
Milk + others	0	2	1	1	0	1	1
Kisrah or *Molah*	12	20	16	0	0	0	7
B. Lunch							
No answer	2	0	1	3	4	4	2
F.B. only	0	0	0	0	0	0	0
F.B. + others (mainly F.B.)	0	0	0	0	9	2	1
Others + F.B.	4	2	3	0	0	0	1
Milk only	6	2	4	0	0	0	2
Milk + others	14	22	18	1	4	2	10
Kisrah or *Molah*	74	74	74	96	83	92	84
C. Dinner							
No answer	2	2	2	0	4	1	1
F.B. only	28	6	17	10	9	10	13
F.B. + others (mainly F.B.)	6	8	7	54	66	56	33
Others + F.B.	16	12	14	29	9	25	20
Milk only	38	52	45	0	4	1	22
Milk + others	0	0	0	7	4	6	3
Kisrah or *Molah*	10	20	15	0	4	1	8

Table 2. Faba bean consumption frequency, amount and expected changes, by sample area[1].

	Farming Areas			Urban Areas			
	Al	Z	Al+Z	K	At	K+At	Total Sample
A. Number of days faba beans consumed each week (percent of household)							
Occasionally	16	38	27	1	0	1	13
One time	10	0	5	0	0	0	2
Two	6	14	10	4	0	4	7
Three	24	24	24	25	13	22	23
Seven	44	24	34	70	87	73	55
Total	100	100	100	100	100	100	100
B. Per capita monthly consumption of faba beans (kg)[2]							
Average	1.48	0.94	1.21	1.54	1.79	1.59	
Standard deviation	1.18	0.98	--	1.40	0.84	--	
C. Expected percentage increase in household faba bean consumption due to a 50% price decrease[3]							
Average (%)	9.1	25.5	--	45.4	33.2	--	
Standard deviation (%)	19.6	59.8	--	50.3	24.0	--	

1 Al = Aliab, Z = Zeidab, K = Khartoum, At = Atbara
2 Calculated from responses on household size and monthly consumption of faba beans
3 Calculated from responses on household consumption

Foul medamas (stewed beans) and *Tamyah* (fried smashed beans) are the most popular faba bean preparations in both urban and rural areas. Large seeded, light brown beans are preferred by the majority of all households. Lentils were mentioned as the first substitute for faba beans in the urban areas. Roughly a quarter of the urban sample, however, stated that there was no substitute for faba beans. In rural areas, other legumes used in *Kisrah* or *Molah* (preparations of stewed vegetables) dishes are substituted for faba beans, and lentils are used less frequently.

A majority of households reported that their consumption of faba beans has increased over the past five years. The main reasons given were the shortage or high cost of other foods and that faba beans are tasty and easy to cook. Average monthly per capita faba consumption in the urban areas is 1.59 kg. This is 0.38 kg higher than in the farming areas (Table 2, B). However, due to the large within-area deviations, the hypothesis of higher per capita faba bean consumption in urban areas is not supported.

The majority of those interviewed in the farming areas reported spending over 75 percent of their household income on food, while the majority of the urban dwellers spend between 25 and 75 percent on food. Consistent with wide variations in consumption levels, the proportion of the food budget spent on faba beans ranged from five to forty percent.

One question asked in the survey was about the change the family would make in faba bean consumption if the price were reduced by 50 percent (Table 2, C). On average in the farming areas, people estimated they would only consume 9 to 25 percent more than at the current price. Greater increases were estimated by the urban residents, with the highest average (in Khartoum) still less than 50 percent. This suggests a low price-elasticity-of-demand for faba beans. However, there was much variation in these responses. One would have more confidence in elasticity estimates if temporal observations were made on quantities purchased and prices paid for faba beans and other foodstuffs.

There are two important implications of low price-elasticity. First, consumers will spend less money for faba beans when prices fall, while consuming slightly more faba beans in their diets, if all other prices are constant. When prices rise the opposite would happen.

The second implication of inelastic demand is that drastic price declines can be expected when large production increases enter the *domestic* faba bean market. In years of high production, farmers could find themselves selling more faba beans but actually receiving less total revenue. The opposite would be the case with a production shortfall: less faba beans on the market would result in such high prices that total sales revenues would be greater than in a year of heavy production. Of course, the supplies and prices of substitute foods and other items of household expense, as well as general population growth and income distributions, also enter the picture. The domestic demand for faba beans will likely expand in the foreseeable future. The market may, therefore, be able to absorb increasing quantities of faba beans in the coming years without depressing farm level prices. However, if demand for faba beans is inelastic, drastic price fluctuations between seasons and between years will continue.

Another point quantified in the survey was the damage caused by insects to faba beans during storage. Bruchid infestation of faba beans in local markets was reported by 89 percent of the urban respondents and 38 percent of those in the farming areas. Seventy-seven percent of the urban respondents, and nearly all those in the farming areas, said bruchid infestation reduces bean prices. It is clear that these insects are major factors in storage and marketing losses (Salkini *et al.,* 1982). Improved storage methods that would control losses from these insects could help preserve abundant harvests of faba beans and stabilize market supplies. This could lead to more stable prices and, therefore, more stable incentives for faba bean producers.

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PROSPECTS FOR BROAD BEAN (*VICIA FABA*) CULTIVATION IN PAKISTAN.

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The major faba bean producing countries are Ethiopia, Morocco, Tunisia, Turkey, Brazil, Ecuador, Peru, and Mexico, with substantial production in Italy, Spain, China and the United Kingdom (Hawtin, 1974). Its introduction to the South-East Asian subcontinent was from the Near East, and its cultivation first started in the North Plains, Kashmir, Ladak, Punjab and the North West Plains (Kogure 1979).

Increasing consumption pressure from the rapidly increasing population, accompanied by low national average yields of traditional pulses (chickpea, lentil, green gram and black gram) made it essential for pulse researchers to adopt stategies which could improve the production of pulses in the country.

Research priorities include:

1. To exploit the yield potential of indigenous pulses through cultural practices, and simultaneously to develop improved varieties through hybridization with exotic cultivars.

2. To introduce new species of food legumes (pulses) such as faba bean (*Vicia faba*), common bean (*Phaseolus vulgaris*), tapery bean (*P. acutifolius*), cowpea (*Vigna unguiculata*), pigeonpea (*Cajanus cajan*) etc., for testing under different agroclimatic conditions.

For example, cowpea was originally native to Africa and has been extensively grown in Latin America and South East Asia. Evidence from the United States suggests that there is a greater yield potential for adapted cowpea cultivars than that from Phaseolus bean (Rachie I974).

Presently the main efforts are directed to the screening of germplasm and other elite material of various pulses to determine their acceptability, adaptability, and yield potential under different climatic and edaphic conditions. The objective of this is to identify those cultivars with a high degree of resistance to pathogenic diseases and of short duration and good yield potential.

Materials and Method

Twenty three cultivars of faba bean obtained from ICARDA, Syria, were evaluated during Rabi 1980-81 in a randomised complete block design with four replications at the National Agricultural Research Centre, Islamabad. Each plot consisted of four rows, each four m long. The spacing between rows was 50 cm, with 10 cm between plants. Fifty kilograms of phosphorous and 20 kg of nitrogen per hectare were applied before seeding. The total rainfall during the growing season was 110 mm which supplemented the residual moisture from preceding Monsoon season. No supplementary irrigation was given and the experiment was kept weed-free.

Results and Discussion

Amongst the 23 cultivars the highest yield was 1381 kg from 75TA 25501, followed by 74TA 12 with a yield of 1322 kg/ha. There were considerable differences between replicates due to soil heterogeneity. Therefore the data could not be analysed statistically to assess the significance of differences between cultivars.

Days taken to 50% flowering were 75 in both of these cultivars, which indicates their similarity in physiological behaviour. There was a 27 day spread in the number of days to 50% flowering amongst the cultivars tested. Early types identified in this experiment will be utilised in breeding programs after the confirmation of these results at other locations. (Table 1).

Table 1. *Yield*, days to 50% flowering and plant height for the cultivars tested.

Cultivar	Days to 50% flowering	Plant ht. (cm)	Yield (kg/ha)
74TA 12	75	95	1322
74TA 22	86	103	891
77MS 88252	86	103	1250
74TA 26062	75	100	1141
74TA 87	86	96	1022
75TA 26083	86	109	875
77MS 28293	98	110	669
75TA 26333	75	114	719
77MS 88030	91	116	788
74TA 367	75	107	799
74TA 374	86	108	1297
77MS 88322	86	98	959
77MS 88323	75	98	938
77MS 88218	91	110	1166
75TA 25501	75	102	1381
77MS 88156	75	117	1203
77TA 498	75	96	1163
78MS 88362	91	111	984
77MS 8840	91	104	575
Hudeiba 72	71	104	853
Syrian local	86	107	1359
Giza-3	75	108	1225
Giza-4	75	108	1150

All the faba bean cultivars tested in this trial yielded in excess of 575 kg/ha, showing a relatively high yield potential relative to national average yields for chickpea (550 kg/ha) and lentils (370 kg/ha).

No differences were observed between cultivars for plant stand and shattering. Plant height ranged from 95 cm to 117 cm.

These results demonstrate the scope for cultivation of faba bean, at least in areas where enough precipitation occurs during the crop cycle.

Detailed studies on various aspects viz. evaluation of new material, nutritional requirements, planting dates, plant population, moisture supply and consumers acceptance etc have been undertaken. The successful diversification of pulses in the country will not only reduce the consumption pressures on low yielding traditional pulses, but will also minimise the nutritional deficiency of the current diet.

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STORAGE OF FABA BEANS IN EGYPT.

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Faba beans are an important part of the diet and are stored for varying periods of time in Egypt. Various systems are in use, some of which are described below.

Storage in *Shounas*

The *shouna* is an open area surrounded by a fence of barbed wire, wood or iron, within which faba beans are deposited in heaps. The produce is exposed to the elements, and the ravages of birds, rats and insect pests. The accumulation of dust, excrement of birds, rats and other pests reduces the quality of the stored produce. The grain also tends to accumulate moisture from the atmosphere, and from seepage of water from below. In some instances lining the floor with concrete or asphalt, roofing, and walling with wire-mesh are used in an attempt to over-come these problems.

Open air storage (*Shouna*), showing the effect of rainfall

Most of the faba bean crop is stored in this manner in some 600 *shounas* throughout the country.

Underground Storage

In villages near the desert and in the Oases, grain is sometimes stored in sand ditches; the grain must be dry. When covered with sand it keeps well and remains free from infestation. The sand ditches must be removed from sources of water, and termites.

South of the Nile Delta there are a number of villages where faba beans are stored in underground pits. The pits are about 2 m in diameter, 3 m deep, and roughly conical in shape, with plastered walls. Access is via an opening in the top. The pits are lined with straw as they are filled and finally sealed with mud.

The accumulation of carbon dioxide in the pit prevents the build up of infestation. The testa also remains white, rather than turning brown as is usual when beans are stored in the open and exposed to light and air. Beans thus stored have better commercial and cooking properties.

Underground storage in the desert

Room-type Stores and Warehouses

Beans are commonly kept in room-type stores. In villages these are mostly built of unbaked bricks and can generally not be made airtight for fumigation.

Warehouse-type stores

Storage in Country Bins

Home-made bins of about 1 ton capacity, built of mud mixed with chaff, are common on farms throughout the country. Insect infestation may be successfully controled by fumigation, but rats, other pests, and rain still cause considerable damage.

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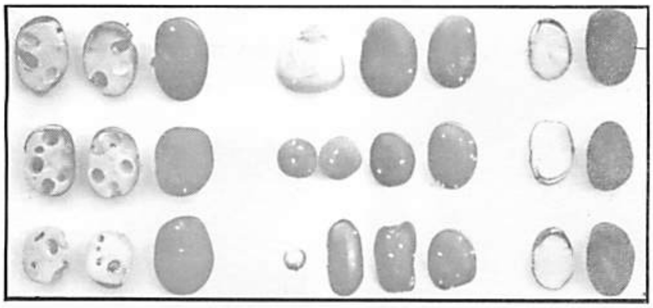

Healthy and insect infested faba bean seeds

Breeding and Genetics

CYTOPLASMIC PARTICLES ASSOCIATED WITH MALE STERILITY IN FABA BEAN (*VICIA FABA*)

Aleth Lefebvre[1], G. Duc[1], R. Scalla[2] and J. Picard[1]
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Electron microscope observations by Edwardson, Bond and Christie (1976) have shown the presence of cytoplasmic particles in male sterile faba bean possessing the *'447'* cytoplasmic factor for sterility. As these particles were absent from fertile plants, their presence seemed to be associated with the factor of male sterility.

These observations have led us to confirm the presence of these particles, to examine their relationship with the *'447'* factor of sterility and to determine their biochemical nature. A possible transmission of these particles was also considered: this could stimulate considerable interest in breeding hybrid lines as no backcrosses would be necessary to obtain a male sterile line.

Results

The presence of cytoplasmic particles (73 nm in diameter) (Fig. 1) in male sterile plants, and their absence in male fertile plants, were confirmed by electron microscope observations on our material.

A biochemical method of semi-purification of the particles was developed. The validity of this method has been checked by observing the purified material with the electron microscope. The method allows the estimation of the amount of particles per unit weight of tissue.

Using tnis method a good relationship between the nature of the cytoplasm and the presence of cytoplasmic particles was established in a number of lines. When the male sterile character disappears due to dominant restorer genes for fertility, or due to a reversion, the particles also disappear. Moreover, there is a good correlation between the stability of male sterility and the amount of particles. A very stable male sterile line has a high content of particles, whereas an unstable male sterile line contains a lesser amount.

The particles are made up of a dense core surrounded by a unit membrane. Cytochemical and biochemical experiments have shown that they contain RNA. This RNA is double-stranded and about 12×10^6 in molecular weight Thus the particles have some characteristics of viruses, but attempts to transmit them have been unsuccessful. However, Grill and Garger (1981) had some success with a dodder bridge and we are currently exploring this method.

Future lines of investigation will include;

- The study of transmission of these particles using graft, dodder bridge or mechanical inoculation.
- Further studies on the biochemical composition and characteristics of the particles.

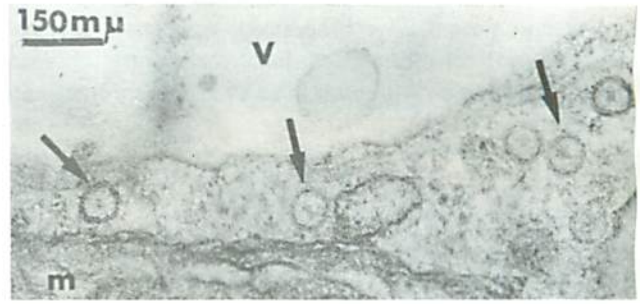

Fig. 1. Section through a synergid in an embryo sac of a male sterile plant
V = vacuole; m = mitochondrion;
⟶ = particles.

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DEVELOPMENT, USE AND HANDLING OF TRISOMICS IN *VICIA FABA.*

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Since the pioneering work of Blakeslee, who was the first to locate a gene in a particular *Datura stramonium* chromosome by analysis of trisomics, aneuploid genetics has played an important role in the study of many organisms, including crops such as barley, cotton, corn, etc.

There are two basic requirements for the development of the genetic map in diploid plants: one, the obtaining of the complete set of trisomics, and two, a good collection of variants with simple and clear inheritance.

One of us (Martin, 1978) found four trisomics in the progeny of a population of *Vicia faba* obtained from the PO-1 mutant (Sjodin, 1971). Any further effort in obtaining trisomics from PO-1 resulted in failure. Furthermore, we lost one of these four trisomics in the course of our work.

We turned again to Sjodin's material and crossed an asynaptic mutant (Sjodin, 1970) with diploid plants. We obtained nine new trisomics and a double trisomic, out of 75 F_1 grains examined. Only trisomics for the subtelocentric chromosomes were obtained. We believe that the plant will not tolerate an additional metacentric chromosome. This addition will result in an excessive chromosomic imbalance.

In newly produced trisomics, two of them are easily morphologicaly identifiable by leaf shape and stem strength. They are different from the other three already obtained from PO-1.

The morphology of the trisomics obtained up to now suggests that we have obtained the complete set of subtelocentric trisomics. We are now trying to identify the critical chromosomes by C-banding. We have already identified the S_a and S_d trisomics (Gonzalez-Garcia *et al.* 1981).

Crosses between S_a and S_d trisomics with different mutants have so far produced negative results concerning the localization of these genes (top-less, short internodes, diffuse, lemon wing spot).

The main problem in handing *V. faba* trisomics is the decrease of the transmission rate in relation to the consanguinity level (Table 1). To solve this difficulty, we are backcrossing the trisomic lines with a self-fertile line to obtain a reasonable transmission.

Table 1. Transmission of trisomy.

VFT*	F_1 Plants	% Trisomics	F_2 Plants	% Trisomic
1	40	30.0	248	15.7
2	52	28.8	235	20.9
3	56	27.3	203	16.7

* VFT = *Vicia faba* trisomic.

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PRELIMINARY RESULTS INDICATING GENETIC VARIABILITY FOR SYMBIOTIC NITROGEN FIXATION ABILITY IN FABA BEAN (*VICIA FABA* L.)

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One of the main factors which make faba bean an interesting crop is its capacity to fix atmospheric nitrogen through symbiosis with *Rhizobium leguminosarum*. Among legume crops faba bean is referred to in many papers as having a high potential for nitrogen fixation, figures of 100 to 200 kg of N fixed per hectare being suggested.

It was decided to look closer at this point under our environmental conditions and therefore we have recently included in our breeding program a measurement of the genetic variability for nitrogen fixing ability. The correlation for this character with the yield components is also taken into account.

Materials and Methods

In 1982, 10 genotypes were established in a sandy and a clay soil in a randomised block design with two replications. The size of the harvested plots was 6 m^2 and the density was 50 plants/m^2.

The genotypes tested were; 2 commercial lines ('Ascott' and 'Deiniol');6 pure lines; 1 F_1 hybrid; and a population selected in Dijon.

No inoculation with *Rhizobium leguminosarum* was applied, as indigenous strains exist in our soils. All genotypes appeared to be nodulated.

Five measurements of acetylene reducing activity (ARA) were made on the following dates; June 3, 14, 21, and 30, and July 12. These were taken on the plants along a 50 cm row. The ARA value given is the number of moles of ethylene produced during 10 minutes by roots enclosed in a vessel containing 10% acetylene. Mean ARA is the mean of these 5 tests.

Mineral nitrogen enriched with N^{15} was also applied to the trial in order to get another measure of the intensity of nitrogen fixing activity.

Dry matter of the stems was measured at maturity.

Results (See tables 1 and 2)

No effect of replication was found throughout our trial for any character. A large genetic variability is shown (1 to 5 in location I, 1 to 10 in location II) for ARA measurement. In the two locations, ranking for ARA of the genotypes is similar. The F_1 hybrid performed well which is in agreement with the heterosis effect that some workers have measured on this character in other crops.

Mean ARA appeared to be well correlated with seed yield and stem weight. A similar correlation was observed in 1981 and could be explained by the fact that a good photosynthetic source could allow a good yield and a high level of N_2 fixing activity of the nodules.

Correlations of ARA with earliness also appear to be of importance. Intensity of N_2 fixation will depend upon duration of the photosynthetic source.

These preliminary results indicate that a plant breeder who wants to select for a higher nitrogen fixation ability cannot do so in isolation, but *will have to consider the* correlations of this factor with yield, earliness and several morphological and physiological traits.

Table 1. Mean ARA, yield components and plant duration for genotypes planted at 2 locations.

	Mean ARA (10^{-9} mole)		Stem DM (g/10 plants)		Seed yield DM (t/ha)		100 seed wt. (g)		Days from sowing to flowering		Days from flowering to maturity	
Genotype	I*	II*	I	II	I	II	I	II	I	II	I	II
196	11.0	2.8	59.5	25.6	3.02	1.69	31.0	29.3	91	73	18	18
F_1 hybrid	9.2	6.9	58.3	26.3	4.80	2.59	95.4	95.2	78.5	59	47	40
Population	7.1	5.2	61.9	34.6	3.01	1.14	45.0	43.9	80	62	45.5	41
Deiniol	6.8	5.1	65.8	28.2	3.84	2.02	40.6	41.5	82	62	36	41
127	6.3	3.5	70.8	28.8	3.11	1.55	54.9	53.8	84	66	38	41.5
Ascott	5.9	6.1	61.1	36.9	4.25	1.88	46.7	47.7	82	64	43.5	43
316	4.1	0.6	50.8	9.8	1.93	0.79	35.6	29.4	80.5	64	39	31
319	2.9	1.6	64.7	15.5	3.53	1.09	65.9	56.4	76	59	40.5	37
370	2.3	1.3	43.0	14.6	3.48	1.05	80.9	68.1	81	61	38	38.5
240	2.2	0.7	54.8	16.6	2.31	0.88	42.9	45.3	79.5	60.5	35	40.5

* I = Clay soil
II = Sandy soil

Table 2. Correlations between characters.

	Mean ARA	Stem dry weight	Seed dry weight	100 seeds weight	Days sowing to flowering	Days flowering to maturity	Days sowing to maturity
Mean ARA	1.000						
Stem dry weight	0.633**	1.000					
Seed dry weight	0.638**	0.826**	1.000				
100 seed weight	0.105	0.032	0.397	1.000			
Days: sowing to flowering	0.522*	0.866**	0.727**	-0.143	1.000		
Days: flowering to maturity	-0.027	0.072	0.155	0.511*	-0.277	1.000	
Days: sowing to maturity	0.466*	0.855**	0.785**	0.229	0.733**	0.451*	1.000

* Significant at 0.05
**Significant at 0.01

Agronomy and Mechanisation

EFFECTS OF *OROBANCHE* ON 49 FABA BEAN LINES AND THE USE OF GLYPHOSATE FOR ITS CONTROL.

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Forty nine lines of faba beans, comprising 46 land races and *3 other genotypes* were evaluated over two seasons in a healthy, and an *Orobanche* infested *field* The land races form part of a collection that was made available through GTZ project No. 75, 2126. 3-10.200 and were collected from 15 provinces in Egypt from farmers who were not using improved varieties.

Glyphosate herbicide (Lancer) was used to control the *Orobanche* in the infested field. Three sprays at three week intervals were given for each of the glyphosate treatments. Total active ingredients used for the three glyphosate treatments were 155, 310 and 465 g/ha for treatments B, C and D respectively. The control (A) treatment was sprayed with water.

Differences in reaction to *Orobanche* were observed between the genotypes. A few lines were observed that might be considered more tolerant than average, whilst many of the lines were severely affected by the parasite.

It was clear that faba bean plants are sensitive to glyphosate, and that the chemical must be used with caution. It may be useful to breed for faba bean lines which tolerate glyphosate. It is felt that this may be feasible, given the variation reflected in differential genotypic reaction to glyphosate observed in this trial.

Orobanche infestation affected nearly all plant characters. As presented in the table, all vegetative and generative characters (except seed index and number of tillers per plant) were reduced by 10 to 70% (Table 1).

Table 1. Effect of *Orobanche* on host characters (pooled data of 2940 plants in two seasons/experiment).

Character	Uninfested	Infested (% of uninfested)
Plant height (cm)	102.3	92.5
Tillers/plant	3.2	103.1
Harvested plants/ridge	29.2	59.6
Pods/plant	19.2	46.4
Seeds/plant	46.1	50.5
Seed yield/plant (g)	29.5	48.6
Seed index (g)	63.1	99.7
Seed yield/ridge (g)	796.7	28.5

The glyphosate herbicide was effective in controlling the *Orobanche*. Treatment C(310 g/ha) is considered to be the most effective, with results from treatments B (ineffective) and D (toxic to the crop) being not statistically significant.

Treatments C and D were effective in controlling *Orobanche* in all entries. However, in certain genotypes (i.e., 245 and 351, both collected from the Gharbia province) treatment B was sufficient for control of the parasite. Thus it is recommended that experiments with glyphosate be performed in farmers fields using their own stocks of seed. Recommending the use of the herbicide should only be done for genotypes which have already been tested. The host genotype x herbicide dose x environment interactions need to be thoroughly investigated.

EFFECT OF SOWING DATE, WATERING REGIME AND MULCHING ON YIELD OF FABA BEANS.

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The possibility of increasing the yields of faba beans through extending the growing season by advancing the sowing date has been under study in the Gezira region of Sudan. Previous work at the Gezira Research Station, Wad Medani and Shambat showed that root rot and wilt diseases affect the crop during the early establishment phase when the crop is planted in early October. Experimental work at the Hudeiba Research Station showed clearly that both diseases are affected by temperature and soil moisture.

Reported here are the results from an experiment conducted at Shambat and Wad Medani to investigate means of reducing disease incidence by manipulation of sowing date, watering regime, and by mulching.

Material and Methods

The experiment consisted of three sowing dates (October 10, 20 and 30), two watering regimes (7 - and 14-day intervals) and with or without mulching (with grass straw at Wad Medani, and ground-nut shells at Shambat), combined in a factorial complete block design with four replicates. Planting was done on the top and to the East side of the ridges (two rows per ridge) at a 20cm plant spacing with two plants per hole. The plots received 43 kg N and 86 kg P_2O_5/ha at sowing in the form of urea and triple superphosphate respectively. Two irrigations were given to establish the crop before the start of the differential irrigation treatments.

Results and Discussion

At Wad Medani, the growing season was characterised by a delay in the onset of relatively cool weather, which came in late November and continued until the third week of February, with intermittent hot spells in early December and late January. The growing season at Shambat had the same characteristics as at Wad Medani, but the 10-day average maximum temperatures at Shambat were less by one or two degrees.

Mulching improved the soil moisture status during the first four weeks of plant growth when moisture losses by direct evaporation from the soil surface due to low canopy cover were important. An additional effect of the mulch may have been partial insulation of the soil from high temperatures. Both moisture stress and high temperatures are known to increase the virulence of wilt and root-rot diseases.

Mulching led to significant increases in the number of plants that survived to maturity, but its effect decreased with the delay in sowing date, with consequent decreases in temperatures; the increase in the number of plants during the first sowing date was 60% over the control for Wad Medani, and 43% at Shambat (Table 1). Overall, mulching increased the grain yield by 21% and 15% over the controls at Wad Medani and Shambat respectively, due mainly to increases in the number of plants and slight increases in the number of pods per plant (Table 2).

Table 1. The interaction of sowing date and mulching on number of plants per m^2 at Wad Medani and Shambat.

Location	Date of sowing	Mulching +	Mulching –	Mean
Wad Medani	Oct. 11	15.2	9.0	12.1
	Oct. 21	20.2	17.0	18.6
	Oct. 31	20.9	19.0	19.9
	S.E.	±0.54		±0.38
Shambat	Oct. 10	8.5	5.9	7.2
	Oct. 20	13.6	12.1	12.8
	Oct. 30	12.0	10.1	11.0
	S.E.	±0.53		±0.37

Table 2. Effect of sowing date, watering intervals and plant protection on the grain yield and some yield components of faba bean at Wad Medani and Shambat.

	Grain yield (kg/ha) Medani	Grain yield (kg/ha) Shambat	Plants/square metre Medani	Plants/square metre Shambat	Pods per plant Medani	Pods per plant Shambat	100 seed wt. (g) Medani	100 seed wt. (g) Shambat	Plant height (cm) Medani	Plant height (cm) Shambat
Sowing date:										
October 10	802	1843	12.1	7.2	12.6	32.8	37.1	35.1	52.4	75.4
October 20	1063	2734	18.6	12.8	11.0	27.5	38.4	35.5	60.2	82.7
October 30	1052	2530	19.9	11.0	16.0	24.8	36.6	36.7	60.4	83.9
S.E. ±	38	87	0.38	0.37	1.3	0.84	0.42	0.51	1.8	1.15
Watering intervals:										
7-days	1354	3269	18.4	11.2	15.5	32.7	37.6	36.5	63.4	87.3
14-days	594	1790	15.4	9.5	10.9	24.0	37.2	35.1	52.0	74.0
S.E. ±	31	71	0.31	0.30	1.0	0.68	0.35	0.41	1.4	0.94
Plant protection:										
Mulch	1073	2702	18.5	11.4	13.6	27.4	37.2	36.2	60.6	81.9
No mulch	885	2357	15.0	9.4	12.8	29.3	37.5	35.2	54.8	79.5
S.E. ±	31	71	0.31	0.30	1.0	0.68	0.35	0.41	1.4	0.94

The watering regime had a profound and highly significant effect on grain yield at both locations. Watering every 7 days increased the grain yield by 128% and 83% compared with irrigation every 14 days at Wad Medani and *Shambat* respectively (Table 3), due to significant increases in the plant stand and the number of pods per plant.

Grain yield was also significantly increased when sowing was delayed from October 10 to October 20. This was due to the improvement in plant stand of 54% at Wad Medani and 78% at Shambat, clearly showing the importance of temperature in disease development and hence plant survival.

At Wad Medani none of the interactions affecting the grain yield were significant, but at Shambat the interactions between sowing date and watering regime, and between mulching and watering interval were significant. The shorter watering regime had a more positive effect on the early sown than on the later sown crop (Table 3).

Although mulching and frequent irrigation reduced disease incidence and hence significantly improved plant stand with the first sowing date, this effect was more than outweighed by the greater plant survival and more vigorous growth of plants sown on the later sowing date (October 20) when the weather was cooler. Plants sown on October 10, irrespective of other treatments, tended to have smaller leaves and thinner stems, and generally to lack vigour when compared to those sown at a later date.

These results tend to indicate that there is little scope for improving yield through advancing the date of sowing unless genotypes tolerant to heat stress are developed.

Table 3. The interaction effect of sowing date and watering intervals on grain yield (kg/ha) of faba bean at Shambat.

	Watering intervals		
Sowing date	**7 - days**	**14 - days**	**Mean**
	(± 123)		(± 87)
October 10	2760	925	1843
October 20	3595	1873	2734
October 30	3451	2573	2530
	(± 71)		
Mean	3269	1790	2529

Irrigated faba bean plots at ICARDA's experimental farm, Tel Hadya, Syria.

Pests and Diseases

A NEW PHOMA BLIGHT DISEASE OF FABA BEAN IN SYRIA.

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An unusual stem symptom was first observed on faba bean plants in 1980, in a chocolate spot and Ascochyta blight disease screening nursery near Lattakia, Syria. The symptoms were characterised by irregular brown lesions, with tiny black pycnidia scattered at random on affected stem tissue. Although symptoms of this blight to some extent resembled those induced by *Ascochyta fabae* Speg., lesions of the former were consistently found only on stems, whilst the latter is found on stem, pods, and leaves.

A fungus was isolated from infected stem tissues, and maintained on potato dextrose agar (PDA) at room temperature (18-20°C). Pycnidia were dark brown, ostiolated, globose, ranging between 150 to 200 μm in diameter. Conidia were hyaline, one-celled, small (3.5 to 5.0 μm in diameter, and 6.0 to 116 μm in length), ovoid, and borne on very short conidiophores (enteroblastic phialides) arising from the inner lining of the pycnidial cavity. Chlamydospores, formed in 4 to 6 week-old cultures, were dark brown, irregular in shape, thick walled and terminal or inter-callary. This fungus was identified by C. Booth at the Commonwealth Mycological Institute as *Phoma medicaginis* Maller and Roum var. *pinodella* (Jones) Boerema, (Punithalingam and Gibson, 1976) under CMI Herb. No. 254776.

Pathogenicity tests were conducted using a12 day old culture propagated at 24°C on faba bean dextrose agar (200 g faba bean seeds, 20 g dextrose and 18 g agar). The contents of one petri dish were placed in a Waring blender containing 500 ml of water, blended for 60 seconds, then sprayed on 8 week old faba bean plants grown in 25 cm pots, employing 25 ml of inoculum per plant. Check plants were sprayed with water only. The plants were then placed in separate moist chambers for 5 days under a shade in the field. Relative humidity and temperature inside these chambers ranged from 90 to 96% and 20 to 28°C, respectively.

All inoculated plants developed typical symptoms, lost their leaves and died within 4 weeks. None of the check plants became infected (Fig. 1). The pathogen was reisolated from all ten infected plants.

In the field, symptoms of Phoma blight were observed on faba bean plants mainly late in the season when the weather was warm and moderately humid. The disease was also occasionally seen early in the season when the weather was cool and humid. Phoma blight has recently been reported on chickpeas from India (Haware and Nene, 1981).

This is the first report of *P. medicaginis* var. *pinodella* as being a pathogen on faba beans in Syria.

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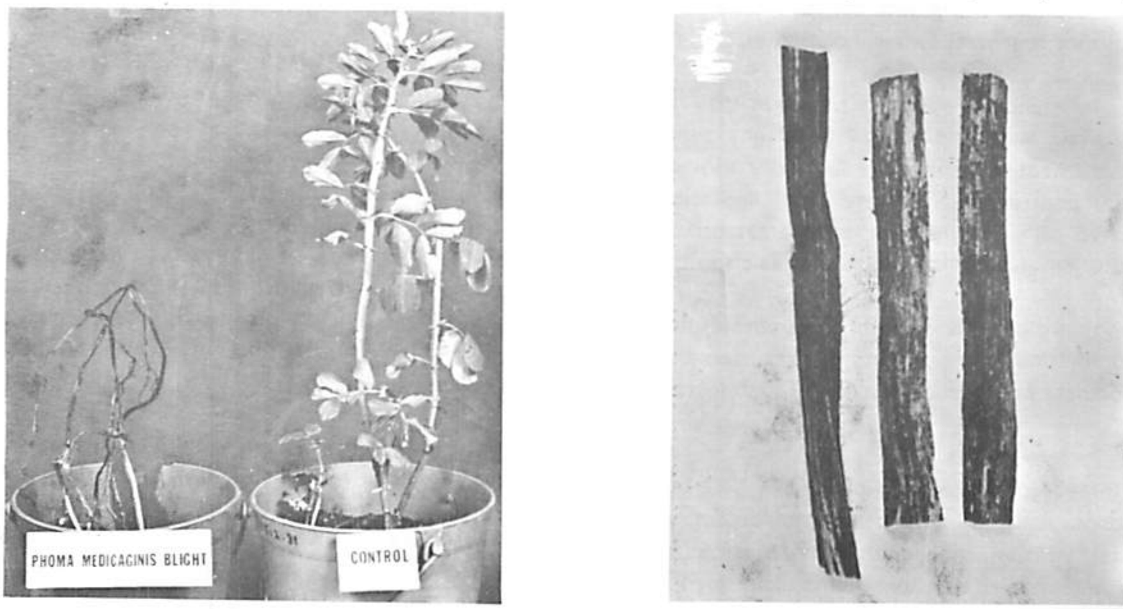

Fig. 1. Faba bean plants inoculated in moist chamber pathogenicity tests with *Phoma medicaginis* var. *pinodella,* showing symptoms on diseased as compared to healthy plants (left), and a close up of infected stems with black scattered pycnidia (right).

REACTION OF SOME WEEDS TO INOCULATION WITH TWO FABA BEAN (*VICIA FABA* L.) VIRUSES.

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Bean yellow mosaic virus (BYMV) is the most widespread virus disease in legume crops, including faba bean, in Egypt. Recently, broad bean wilt virus (BBWV), which was isolated previously from pea (*Pisum sativum*) by Kishtah *et al* (1978), was isolated again from two aphid vectors, *Aphis craccivora* and *Myzus persicae* collected from faba bean fields at the Giza Experimental Station.

The two viruses were not seed transmitted in any of their legume hosts (unpublished data). However, *A. craccivora* and *M. persicae* are quite active throughout the faba bean growing season, which extends from October to June. These insects seem to be responsible for the spread of virus diseases within the crop and from one crop to another, with annual weed plants possibly acting as the alternate hosts in the intervening period. Since the role of such weeds in the epidemiology of faba bean viruses has not so far been studied, an experiment was designed to test this hypothesis.

Seeds of *Sonchus oleraceus, Sisymbrium irio, Emex spinosus, Malva parviflora, Medicago hispida, Melilotus indicus* and *M. siculus* were collected from the fields. Seedlings were mechanically inoculated with either BYMV or BBWV at the three to four leaf stage, with adequate numbers of seedlings being left for the control. Plants were observed for four weeks after inoculation.

Only leguminous weeds viz. *Medicago hispida, Melilotus indicus* and *M. siculus* showed any symptoms from BYMV. Infected plants were generally shorter than those of the control. Leaves were small and showed a mosaic pattern of dark and light green areas on the leaf blades. Puckering and curling of leaves was also observed.

Plants that did not show symptoms with either virus were tested for their being symptomless carriers by using them to inoculate faba bean seedlings. All such tests proved negative.

The three leguminous hosts of BYMV were tested as possible donor plants to faba bean using insect vectors. Non-infected, wingless individuals of *M.persicae* and *A. craccivora* were starved for two hours, and then fed on BYMV- infected plants of *Melilotus indicus, M. siculus* or *Medicago hispida* for 15 minutes. They were then transferred to healthy faba bean seedlings for 24 hours, after which the aphids were killed. Faba bean seedlings developed a mosaic 10-12 days later. Epidermal strips taken from the leaves of the infected faba bean plants were then examined for inclusion bodies after staining with pyronine-methyl green stain (Jordan and Baker, 1955). The amorphous inclusions characteristic of BYMV infection were observed in the cells of the faba bean plants.

Seeds from infected weed plants were sown in pots in the greenhouse and the resultant seedlings were examined for symptoms of virus infection. None of the seedlings showed any symptoms, indicating that BYMV is not transmitted by the seeds of these weed hosts.

Thus it appears that the overlapping of legume crops and the availability of aphid vectors are the main factors responsible for the spread of BYMV, at least, both between and within crops.

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PEA LEAF ROLL VIRUS IN FABA BEAN

M.A. Tolba
Plant Virus Research Section, Institute of Plant Pathology, Agricultural Research Center, Giza, EGYPT.

Some faba bean plants in Middle Egypt were observed to be stunted and showed yellowing. Leaves were reduced in size leathery, chlorotic and cup shaped, suggesting natural virus infection. Infected plants did r.ot flower, and subsequently no pods were formed.

Mechanical transmission to healthy plants did not induce any symptoms. The virus was, however, readily transmitted by *Aphis craccivora*. Several leguminous plants were infected.

According to symptomatology, host range, transmission and serological reaction, it is suggested that the isolated virus is a strain of pea leaf roll virus.

Seed Quality and Nutrition

THE AMINO ACID COMPOSITION OF HIGH AND LOW PROTEIN FABA BEAN (*VICIA FABA*) VARIETIES AND SELECTIONS.

D.W. Griffiths,
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The possibility of improving the protein content of faba beans by plant breeding is currently being evaluated, and the effects of such a selection programme on amino acid composition is likely to be of considerable nutritional significance. Consequently, seed samples from a number of high and low protein single plant selections, made from within the variety 'Dacre', were analysed for amino acid content, together with a high protein mutant line (Ch 465), originating from Svalof, Sweden, and a low protein line (Ch 487), collected in Ethiopia.

The results, some of which are presented in Table 1, indicated that the amino acid profile of the high protein 'Dacre' selection was almost identical with that of the high protein mutant line, and similarly the low protein 'Dacre' selection showed close agreement with the values for the low protein Ethiopian line. Significant differences were found on comparing the methionine values of the two low protein samples, the Ethiopian line having the higher value. However, when the total sulphur amino acid content of the two low protein samples were compared, the values for methionine plus cystine were almost identical, thus conferring no significant nutritional advantage to the Ethiopian line.

Table 1. The essential amino acid composition (g/100 g protein) of high and low protein lines of faba beans.

	High protein lines		Low protein lines	
	Dacre 'H'	Ch 465	Dacre 'L'	Ch 487
Threonine	3.7	3.9	4.1	4.0
Cystine	0.9	0.8	1.3	1.1
Valine	4.4	4.7	4.8	4.8
Methionine	0.5	0.5	0.7	0.5
Iso-leucine	4.2	4.1	4.6	4.4
Leucine	8.0	8.1	8.1	8.3
Phenylalanine	4.6	4.9	4.7	4.2
Histidine	3.3	3.0	3.2	3.0
Lysine	6.4	6.3	7.7	7.5
Arginine	11.4	11.3	7.3	8.6
Crude protein (%)	37.5	38.5	24.0	24.2

Comparison of the high protein group with the low protein group revealed that the former had significantly higher arginine values and lower lysine content, with the levels of the other nutritionally essential amino acids being only marginally affected by protein content.

The survey was then extended to include a further 29 genotypes, populations and varieties, with protein contents falling within the extreme values originally analysed. The results of correlating crude protein content with individual amino acid concentrations (g/100 g protein) produced ten statistically significant correlations. Of these, six, namely cystine, methionine, phenylalanine, histidine, lysine and arginine could be considered to be nutritionally essential and all, with the exception of arginine, were negatively correlated, indicating that as protein content increased, the relative concentrations in the protein of these amino acids tended to decline. The calculated rates of decline of these negatively correlated amino acids were, with the exception of lysine, relatively small suggesting that even at exceptionally high protein levels neither histidine nor phenylalanine would be expected to become nutritionally limiting. Although a statistically significant negative correlation was found for the sulphur amino acids, it was of interest to note that this was not reflected in the values obtained for the extreme high and low protein selections as given in Table 1. The level of lysine was, however, observed to decrease more rapidly than any other amino acids with, as was found by Bond (1974) in his study of the lysine content of some 15 varieties, the high protein varieties containing significantly less lysine than the low protein varieties. In contrast arginine content rose steeply with increasing protein content, the magnitude of the rate of increase being clearly demonstrated by the values obtained for the high and low protein groups.

Attempts to relate the observed data to changes in the relative amounts of the storage proteins vicilin and legumin were not entirely successful, and consequently it would appear that the albumin fraction may also be susceptible to changes in protein content and/or alternatively, as suggested by Barratt (1982), the amino acid profile may be significantly altered by the presence of large quantities of uncombined amino acids in the high protein line.

Nutritionally it would appear that selecting for improved protein content would result in a slight decrease in protein quality and particular attention should be given to lysine content since a large decrease in its relative concentration would result in the crop no longer being suitable as a high lysine supplement to cereal based diets.

References

Bond, D.A. (1974). Die Züchtung von Hybrid-und synthetischen Sorten in Cambridge/England. In: Z.Göttinger Pflanzenzüchten Seminar, Ernahrungsqualität und Züchtung von Ackerbohnen (*Vicia faba minor*) pp. 39 - 63.

Barratt, D.H.P. (1982). Chemical composition of mature seeds from different cultivars and lines of *Vicia faba* L. J.Sci. Fd Agric. 33, 603 - 608.

Meeting Report

1st INTERNATIONAL *VICIA FABA* CYTOGENETICS REVIEW MEETING, Wye College, University of London, 7th-9th February 1983.

G.P. Chapman,
Wye College, University of London, Ashford, Kent, TN25 5AH, ENGLAND.

Following a suggestion at an E.E.C. Grain Legume seminar in Dijon, France during July 1982, an international meeting *was convened* to review the cytogenetics of *Vicia faba.* Representatives of six countries attended the sessions. The following papers were presented:

"*Vicia faba* as a cytological model"
Professor R. Rieger, Akademie der Wissenschaften der DDR, Zentralinstitut fur Genetik und Kulturpflanzenforschung.

"Recent developments in the study of *Vicia faba*"
Dr. G.P. Chapman Wye College, University of London.

"Genetic variation as seen by the breeder"
Dr. D. Bond, Plant Breeding Institute, Cambridge.

"Microdensitometric analysis of chromosome images in *Vicia faba*"
Professor E. Filippone, Professor L.M. Monti, University of Naples, Portici.

"The isolation and ultrastructural study of the *Vicia* chromosome"
Miss S.A. Cooke, Wye College.

"Induction of a dicentric chromosome and its consequences for genetic variability"
Professor L.M. Monti, University of Naples, Portici
Dr. F. Saccardo, ENGA, Casaccia, Rome.

"Morphology of faba bean trisomics"
Professor J-I. Cubero, Escuela Technica Superior de Ingenieros Agronomos, Departmento de Genetica, Cordoba, Spain.

"Obtaining and handling faba bean trisomics"
Dr. A.A. Martin, Cordoba.

"Testing *Vicia faba* cultivars for distinctness, uniformity and stability"
Mr. J. Higgins, National Institute of Agricultural Botany, Cambridge.

"Genetics, Physiology and Yield"
Dr. W.E. Peat, Wye College.

"Sources and mechanisms of resistance to chocolate spot disease"
Dr. J. Mansfield, Wye College.

Since the beginning of cytological studies, *Vicia faba* has been a subject of classical interest and its literature is compendious. Recently the breeding of *Vicia faba* has assumed increasing importance. The purpose of this meeting was to explore how far it was possible to pool these hitherto divergent interests, together with the more recently developed techniques of molecular biology in a new approach to *Vicia faba* cytogenetics.

The principal conclusions of the meeting were as follows.

1. The publication 'Genetic Variation within *Vicia faba*'* would be revised and expanded using Database technology under the guidance of Dr. F.A. Bisby of the University of Southampton to include a more complete account of chromosome aberration stocks and (as it becomes available) data on DNA sequencing, for example.

2. The aim is to establish a model of chromosome structure that finally resolves the problem of multistrandedness and which reconciles data from optical and electron microscopy and molecular biology.

3. Readily available stocks, both of tester translocations and a complete set of trisomics would be assembled so that in several institutes a coordinated organisation of linkage data could take place. Professor Cubero undertook to organise this, although the meeting recognised that emphasis in his Department was on chromosome aberration rather than on maintaining a large collection of mutants, for which other institutions would be responsible.

4. A reasonable target for linkage data was, over five years, upwards of 30 gene sites, with some emphasis on characters for stature, growth habit and disease resistance. It was decided that, while recognising the pioneering work of Dr. J. Sjodin of Svalof in allocating genes to chromosomes in this species, we would adopt the chromosome notation of Michaelis and Rieger (1959, 1968) for further linkage studies.

5. In the longer term, there should be a coordinated approach to investigating the DNA sequencing of preferen-

* Published as a supplement to the FABIS service.

tial breakage sites and an attempt to relate the composition of genetically active DNA to known gene sites and to chromosome banding patterns.

6. Interesting mutant forms would be made available to breeders, physiologists, agronomists and pathologists so as to widen our knowledge of plant efficiency.

7. A small organising committee of five people was to be established to coordinate these various objectives. Dr. G. P. Chapman at Wye was elected Convenor. Professor Cubero was also appointed, together with Professor Rieger. Two other invitations are pending at present.

The meeting was one that brought together scientists of diverse backgrounds and was essentially exploratory. It was, however, soon apparent that *Vicia faba* cytogenetics represents an area of research highly relevant to the future development of the crop and it is planned to hold a larger, more widely publicised meeting at Wye in (probably) the Spring of 1984. Enquiries and offers of papers and posters should be sent to Dr. G.P. Chapman at Wye College.

The organisers of this first meeting express their thanks to all the participants, not least to the Zeiss Company of West Germany for its demonstration at the meeting of the EM. 109 electron microscope and a range of optical microscopes.

References

Michaelis, A. and Rieger, R. (1959) 'Structurheterozygotie bei *Vicia faba*' Zuchter 29, 354-361.

Michaelis, A. and Rieger, R. (1968) 'On the distribution between chromosomes of chemically induced chromatid aberrations: studies with a new karyotype of *V. faba*' Mutation Res. 6, 81-92.

WANTED

Dr. Barbara Pickersgill will appreciate receiving seeds of different wild species of *Vicia* for her work on interspecific hybridisation. The seeds may be sent to the following address;

Dr. Barbara Pickersgill
Dept. of Agricultural Botany,
Plant Science Laboratories,
University of Reading,
Whiteknights,
Reading, RG6 2AS,
ENGLAND

FABIS
Co-ordinating Committee Members

EGYPT	**Dr. Abdalla Nassib** Food Legume Section, Field Crops Institute, Agricultural Research Center, Giza.
SUDAN	**Dr. Farouk A. Salih** Agricultural Research Corporation, Hudeiba Research Station, P.O. Box 31, Ed-Damer.
SYRIA	**Dr. Mohan Saxena** Food Legume Improvement Program, ICARDA, P.O. Box 5466, Aleppo.
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SPAIN	**Dr. J.I. Cubero** Escuela Technica Superior de Ingenieros Agronomos, Departmento di Genetica, Apartado 246, Cordoba.
U.K.	**Dr. D.A. Bond** Plant Breeding Institute, Maris Lane, Trumpington, Cambridge CB2 2LQ.

STYLE AND FORM FOR FABIS CONTRIBUTIONS

Please remember the following guidelines:

General Articles

* must not be more than 1500 words
* edited articles will be returned to authors for approval if the originals were submitted before December 1st for June issue and July 1st for December issue.

Short Communications

* must not be more than 600 words and may in addition include one Diagram/ Figure/ Photograph.
* should contain a single theme, even if this means more than one article is submitted by the same author.

* contributions should not consist of outlines of research programs carried out at institutions.
* all references cited should be directly relevant to the content of the article. Additional references will be welcomed but not included in the newsletter (they may be published in future bibliographies).
* contributions must be typed double-spaced.
* the species should be referred to as *Vicia faba or faba beans.*
* sub-classes should be referred to as *Vicia faba minor, Vicia faba major* etc.
* numbers in the text less than 10 (except for measurements) should be written one two three etc.
* unless they form part of a series containing numbers greater than 10 or appear at the beginning of a sentence.
* yields should be expressed in t/ha or kg/ha.

If these Style and Form conditions are not met, the Editors reserve the right to shorten or otherwise alter the text so that it meets the requirements of FABIS. Thank you

Please Note :

While FABIS articles are not refereed as in other journals, we do reserve the right to refer individual articles back to an author in such cases where there are technical inconsistencies. This may mean that an article submitted to FABIS does not necessarily appear in the next published issue of the Newsletter. This, however, should not result in a long delay in publication, as the frequency of the Newsletter is being increased.

The views expressed in FABIS articles are those of the individual authors, and do not necessarily represent the views of ICARDA. Likewise, the results presented in FABIS articles are the responsibility of the individual authors.

ANNOUNCEMENT

I D R C Grant

We gratefully acknowledge the very generous grant from IDRC (the International Development Research Centre) for the development of FABIS and to enable the more frequent publication of the FABIS Newsletter.

This grant also includes funding for the development of special bibliographies, and a question and answer service on all aspects of faba bean research, a facility we hope our subscribers will utilise to the fullest extent.

Vicieae Experimental Information Service: Trial period Dec. 82 - Aug. 83

This is to announce that this experimental information service is now available and will operate for a trial period of 9 months (December 1982 - August 1983). Enquiries are invited concerning the classification, morphology, chromosome counts, phytochemistry, geographical distribution, seed availability and nomenclature of species in the tribe *Vicieae*. We recognise 302 species in the *Vicieae* comprising 144 spp. of Lathyrus, 5 spp. of *Lens*, 2 spp. of *Pisum*, 1 sp. of *Vavilovia* and 150 spp. of *Vicia*. We hold a limited amount of information on subspecies and none on cultivars.

Enquiries should be made to the following address:-

F.A. Bisby,
Vicieae Database Project,
Biology Department, Building 44,
University of Southampton,
Southampton, SO9 5NH,
United Kingdom

Telex No. : 47661 Sotonu G.
Telephone : National (0703) 559122 Ext 2444,
International I 44 703 559122 Ext 2444.M.

Twice a year

The FABIS Newsletter is now scheduled to appear twice a year, in June and December. As such we are in need of both General Articles and Short Communications, and we hope that the flow of material from our subscribers will be maintained or increased.

We apologise for the late appearance of FABIS No. 5, and hope that all those on our mailing list have now received their copies.

Subscriptions

The annual subscription for FABIS is now U.S. $ 10. The various methods of payment are;

- U.S. Dollar draft drawn on a U.K. bank, payable to 'ICARDA'.
- Eurocheque in U.S. Dollars (place must state 'London'), payable to 'ICARDA'.
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- Direct transfer to ICARDA's bank account at; Hongkong and Shanghai Banking Corp., P.O.Box 199, 99, Bishopsgate, London EC2P 2LA, ENGLAND. A/C no. 729-195-43.

Mailing List

We are having many items of correspondence returned, due to those on our mailing list having changed their addresses or left their place of employment without notifying us. Obviously this represents a considerable waste of money to the FABIS service.

We request that those who currently receive FABIS should inform us of any change in their address or position in good time to allow us to maintain an efficient service.

Reprints

ICARDA has been designated as the world centre for information on faba beans, and as such we are trying to assemble a complete collection of papers relevant to this subject.

We would be most grateful if readers who have published papers relating to faba beans would send reprints to;

FABIS
Documentation Unit
ICARDA
P.O.Box 5466
Aleppo, SYRIA

General Articles for FABIS No. 8

The focus of General Articles for FABIS Newsletter No. 8 will be Physiology and Microbiology of the faba bean crop. As usual Short Communications on any subject relating to faba bean will be welcome.

Those wishing to submit articles should do so as soon as possible. Deadline for submission is December 31, 1983.

ERRATA

FABIS Newsletter No. 5, page 37, second column, line 5. This should read "16.9 to 34.4% (18.6 to 37.8% dry basis)".

We apologise to the authors for this error.

EEC *VICIA FABA* SEMINAR

The next EEC *Vicia faba seminar* will be held at the School of Agriculture, University of Nottingham, Sutton Bonington, Nr. Loughborough, Leicestershire, UK from September 14 - 16, 1983.

The seminar will review the progress in the *Vicia faba* projects of the 1979 - 83 program but additional papers covering original work and new data on physiology, breeding, agronomy, pests, diseases, harvesting, storage, drying and the utilisation of the crop would be considered.

Those interested in presenting a paper at this seminar may contact;

Dr. P.D. Hebblethwaite,
Senior Lecturer in Agronomy,
School of Agriculture,
Sutton Bonington,
Loughborough, LE12 5RD
ENGLAND

FABA BEAN IMPROVEMENT

edited by
G. HAWTIN and C. WEBB
ICARDA, Aleppo, Syria

World Crops: Production, Utilization and Description 6.

1982. 390 pp. cloth
Dfl. 100.00 (approx. US$ 42.50) ISBN 90-247-2593-3

This authoritative reference book is based on papers presented at the International Conference on Faba Beans sponsored by the ICARDA/IFAD Nile Valley Project in Cairo.

Compiled by 60 accepted world authorities, Faba Bean Improvement focuses on genetic improvement, the development of cultural practices, control of pests, diseases and weeds, nitrogen fixation, and the use of faba beans as a human food.

This book will be of wide interest and relevance to scientists, students, nutritionists, extension workers, and others who are interested in this important crop.

Contents

Proceedings of the International Faba Bean Conference
Cairo, March, 1981
ICARDA, 1982, 147 pp.

This publication is intended as a supplement to 'Faba Bean Improvement' (Martinus-Nijhoff, 1982) and contains the opening remarks; a summary of the discussions of the papers presented; recommendations of the conference; concluding statements, and a list of the participants.

In addition, six papers on faba bean research and production in Cyprus, Ethiopia, Jordan, Lebanon, Spain, and Turkey are presented.

All those who participated in the Conference will have received a copy of these Proceedings. Others can address their request to:

FABIS
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P.O.Box 5466
Aleppo, SYRIA

Vicia faba: **Feeding Value, Processing and Viruses.**
Proceedings of a seminar in the EEC Program of Co-ordination of Research on the Improvement of the Production of Plant Proteins, held at Cambridge, England, June 1979, D.A. Bond ed.
Martinus-Nijhoff 1980, 422 pp.

The main topics covered in this book are the feeding value and processing of the faba bean; the chemical composition of *Vicia faba* and the results of comparative tests carried out on a number of animal species are discussed in relation to the nutritional value of the bean. Processing of *Vicia faba* for animal and human consumption is also discussed. Problems associated with viruses affecting *Vicia faba* are detailed with reference to control and breeding for resistance.

Other topics include breeding research, growth regulation and yield variation.

For further information contact;
Martinus-Nijhoff Publishers b.v.
P.O.Box 566,
The Hague, 2501 CN
THE NETHERLANDS

Nile Valley Faba Bean Abstracts. *Ed. by E.M. Vincent. Published by the Commonwealth Agricultural Bureaux (CAB) for the ICARDA/IFAD Nile Valley Project (1982). ISBN 085 198 5033. 131 pp.*

This publication is a compilation of abstracts of research papers and theses on research carried out on faba beans in Egypt and in the Sudan up to and including 1980. Abstracts have been reproduced from CAB journals as well as being prepared at the Documentation Unit, ICARDA, and at the Commonwealth Bureaux of Pasture and Field Crops, Hurley, U.K.

Copies may be obtained from:

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P.O.Box 5466
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The Faba Bean (*Vicia faba* L.)
A Basis for Improvement

Edited by Paul D. Habblethwaite,
Senior Lecturer in Agronomy,
University of Nottingham School of Agriculture.

The aim of this book is to collate and review the substantial amount of research and breeding work that has been carried out world-wide on the faba bean crop. Wherever possible, areas in which further research is needed are highlighted with a view to increasing and stabilising yields.

The Faba Bean - A Basis for Improvement will enable research workers to obtain an up-to-date evaluation of the problems related to *Vicia faba* production on a world scale and will be a useful reference for scientists, advisors and students at all levels.

Contents

I - Background, Physiology and Breeding: Background and history of faba bean production. Classification, origin, breeding methods and objectives. Pollination. Developmental physiology. Reproductive physiology of *Vicia faba* L. Chemical constituents and biochemistry. The influence of growth regulators on development and yield of *Vicia faba* L. Cytogenetics. Water relations and irrigation response. Nitrogen fixation. **II - Husbandry:** Beans in crop rotations. The husbandry of establishment and maintenance. **III - Pests:** Aphid pests. Nematode pests of *Vicia faba* L. Pests of *Vicia faba* other than aphids and nematodes. **IV - Diseases:** Root diseases of *Vicia faba* L. Viruses and virus-like diseases of *Vicia faba* L. Shoot diseases caused by fungal pathogens. Parasitic diseases in *Vicia faba* L. with special reference to broomrape (*Orobanche crenata* Forsk). **V - Harvesting, Drying, Storage and Utilization:** Grain and whole-crop harvesting, drying and storage. Utilization of *Vicia faba* L.

Publication due August 1983
234 x 165 mm 448 pp approx.
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