ADDENDUM TO FIRST & SECOND REPORT ON VIRUS DISEASES OF VICIA FABA & SOME OTHER CROPS IN THE NILE VALLEY (SUDAN & EGYPT) AND THE INVOLVEMENT OF ICARDA

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INTRODUCTION

The author participated in the International Conference on Faba beans from 7 to 11 March 1981 in Cairo, sponsored by ICARDA/IFAD Nile Valley Project in cooperation with the Government of Egypt. There, he presented a review paper on "virus diseases of faba beans" (Bos, 1981b). He also gave a seminar at the Plant Pathology Institute, Agricultural Research Centre, Giza, on "applied research on plant viruses and virus diseases".

After the conference he participated in part of the National Food Legume Seminar at Mariut on 13 and 14 March, and visited faba bean trials and seed production and farmers' fields at Nubaria, Giza, and Seds. From March 15 to 20 he visited Lebanon and Syria for further visits to faba bean trials at Terbol in Lebanon and Tel Hadya and Lattaquieh in Syria and to ICARDA Research Station, Tel Hadya.

This report further confirms and extends observations and conclusion concerning Sudan and Egypt, presented in two pervious reports (Bos, 1980-1981a). This time, the number of observations made on virus diseases were limited because practically all field visits in Lebanon and Syria formed part of a general faba-bean excursion for foreign experts with diverse interests, who had participated in the above conference and seminar.

OBSERVATIONS

Egypt

In lower Egypt mosaic was prevalent in the one field visited at Nubaria. In middle Egypt practically no mosaic was observed in trial fields at Seds and in a number of farmers' fields.

Severe yellowing, leaf rolling and plant stunting highly characteristic of bean leafroll virus infection was observed in two small isolated spots in a production field at the Research Station at Seds. In trial fields at the Agricultural Research Centre,Giza, incidence of severe mosaic was high and several plants showed leafrolling and yellowing. Aphids started colonizing some plants.

Lebanon

In the ICARDA trials at Terbol station no virus symptoms were found, but bean leafroll (yellows) has been observed in previous years (Dr. Hawtin, personal communication, 1981). The crop was still young and practically no aphids occurred.

Syria

At the ICARDA Research Station, Tel Hadya, faba bean was virtually free from virus symptoms. In the entomology experiments in the plastic house a number of faba-bean showed symptoms of leafroll. Only a small part of the newly introduced material (germplasm) of faba beans and fodder peas grown in screenhouse and field could be visually inspected, but no symptoms characteristic of virus infection were observed. In the field trials at Lattaquieh a few plants had mosaic but several plants showed symptoms of leafroll, including yellowing and severe stunting. The same held for a farmers' field on the way back to Aleppo. Leafroll-infected plants showed a clearly increased predisposition to attack by a number of leaf fungi. In general practically no aphids were observed. Crops at Tel Hadya were still young, but in full bloom and early pod set at Lattaquieh.

DISCUSSION

The symptoms of leafroll in faba beans as now observed at Seds (Egypt) and Lattaquieh (Syria) with a drastic effect on plant size and yield are typical of infection by bean leafroll virus as described for Iran by Kaiser (1972,1973). The reason of usual recovery of infected plants from disease as observed in Sudan (Bos,1980,1981a) remains obscure but may have something to do with virus strain or growing conditions.

Low incidence of the disease in Egypt, Terbol (Lebanon) and Tel Hadya (Syria) may be due to low aphid population densities observed there and to lack of nearby perennial fodder legumes, particularly lucerne (Mediago sativa). The latter effect seems striking in Egypt with the main fodder legume, Trifolium alexandrinum, only being grown during winter and resown each year. Higher disease incidence in the coastal region of Syria may be ascribed to more diverse crop cultivation and more diverse wild vegetation.

The farmer's crop visited there and reports on high incidence of similar symptoms in faba bean in Jordan (Dr. Mamluk, ICARDA, personal communication 1981) and in North Africa, together with related diseases in chickpea (up to 50% incidence in Algeria), lentil and pea (Reddy et al., 1980), and in Iran (Kaiser, 1972, 1973) indicate that the virus is not of mere potential importance in the region covered by ICARDA.

Mosaic caused by bean yellow mosaic virus and alfalfa mosaic virus, both transmitted by aphids in the non-persistent manner, also greatly depend on perennial legumes as sources of infection. They may increasingly come to the fore with intensified cultivation of fodder legumes. Gladiolus, increasingly grown in the Nile delta may act as an important source of infection of bean yellow mosaic virus.

Relatively high virus incidence in trial fields of the Agricultural Research Centre at Giza is illustrative of the usual situation at research centres and breeding stations with a great variety of crops and other plant species around.

In Sudan, mosaic often occurs in high incidence, particularly in late-sown crops (Bos, 1981a). Both leafroll and mosaic deserve attention in breeding programs. For breeding, knowledge of virus and strain identity and development of screening techniques are required.

The absence of clear mosaic symptoms at my tentative visual screening of part of the germplasm material in field and screenbouse at Tel Hadya is some-what relieving, but conflicting with data from the literature. Kaiser (1973) e.g. detected 01-09% infection with bean yellow mosaic virus in seed of 12 out of 20 broad bean lines from 9 countries. Moreover, 6 out of the 16 viruses soufar reported from faba beans in the literature have already been found to be seed-borne in faba bean (cf. Bos, 1981b). Hence, special attention should be given to imported germplasm. Germplasm collections have often been found to be collections of seed-borne pathogens as well (for details and further literature see Bos, 1977). Since many viruses are polyphagous, and virus problems of various crops and wild species are related or identical, much weight should be given to virus freedom of all germplasm shipped in and out of ICARDA. Pea seed-borne virus, which has recently been found to be seed-borne in faba bean as well, may serve as an example of problems resulting from world wide germplasm transfer without adequate virological escort (Bos et al, 1979).

Efficient techniques for large-scale detection in seed or seedlings are not yet available for all seed-borne viruses, infection from the seed may be symptomless in seeds, and rates of seed infection may be extremely low, and easily escape attention.

Hence, provisions for quarantine and phytosanitary certification will have to be taken (e.g. Hewitt and Chiarappa, 1977).

By international agreement this is the task of gevernments and their plant protection services of the countries concerned. With lack of facilities and expertise this may lead to severe impediment of the exchange of valuable germplasm and measures have to be realistic. At ICRISAT, Hyderabad, India, efficient collaboration exists between the quarantine authority of the Government of India at its Central Plant Protection Training Institute and ICRISAT, where a Post-entry Quarantine Isolation Area has been made available and an Export Certification Quarantine Laboratory has been established, issuing phytosanitary Certificates under the supervision of the Government of India (Nirula, 1979, 1980).

FINAL CONCLUSIONS AND RECOMMENDATION

1. *Leafroll, yellowing and stunting due to bean leafroll virus is already* prevalent in several countries of the Middle East and North Africa and occurs in most other countries including Egypt and Sudan. It has a potential for further increase with further intensification of the cultivation of perennial clovers. Control will mainly be by breeding for resistance.

2. Mosaic diseases, particularly those due to bean yellow mosaic virus and alfalfa mosaic virus are economically important in certain areas of the region covered by ICARDA and particularly at late sowing. Breeding for resistance may have to provide the main solution.

3. With further changes in crop ecosystems the above and other viruses are likely to come to the fore. Crop improvement programmes will constantly require assistance by plant virology.

Phloem-limited viruses, such as the persistent aphid-transmitted bean leafroll virus, and phloem-limited mycoplasmas, such as the leafhopper-borne incitant of faba bean phyllody, are not seed borne. Most seed-transmitted viruses, however, are readily insect-transmitted and some spread by nematodes in the soil. Those viruses that are spread by insects are transmitted in the non-persistent way and thus over short distances only.

Imported germplasm material ideally should first be grown and tested in insect-free screen-or glasshouses. Seed harvested from plants that upon testing have proved free of virus may then be used for further multiplication in the open. Seed production may also be on plants tested as seedlings in a screen or glasshouse and thereafter transplanted to a post-entry quarantine isolation area.

Opinions differ as to whether imported seeds may be directly sown in the open in an isolated field. Then, growing should preferably be during the insect (vector)-free season. This does not prevent soil-borne viruses to become established, but these require the presence of special nematodes or fungi. Intensive treatment with insecticides does not guarantee prevention of spread, since uptake and transmission seed-transmitted viruses, e.g. by aphids, is in very short probes. Starting from emergence, the plants must be frequently examined for symptoms and suspected plants be immediately removed and destroyed. It should be noted that introduction of seed-borne virus, e.g. from outside sources, after flowering usually no more leads to seed infection. However, virus-infected seeds may also be produced on symptomless mother plants fertilized with pollen from infected plants.

Likewise great care should be taken to prevent distribution of pathogens including viruses with germplasm distributed by ICARDA. Countries participating in ICARDA crop-improvement programmes may not yet require health certificates for imported propagation material but will undoubtedly do so in future. Apart from that, ICARDA cannot afford distributing pest and diseases together with valuable germplasm.

4. Six out of 16 viruses so far reported from naturally infected faba beans have already been found to be seed-borne, although often in low percentages. Fool-proof systems to completely prevent interregional and international spread of such viruses may be impossible, but the risks of spread should be minimized. At ICARDA, provisions are required for quarantine at entry of germplasm and for phytosanitary certification at export. Viruses pose special problems for their detection.

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