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STUDIES WITH BEAN YELLOW MOSAIC VIRUS IN IRAN

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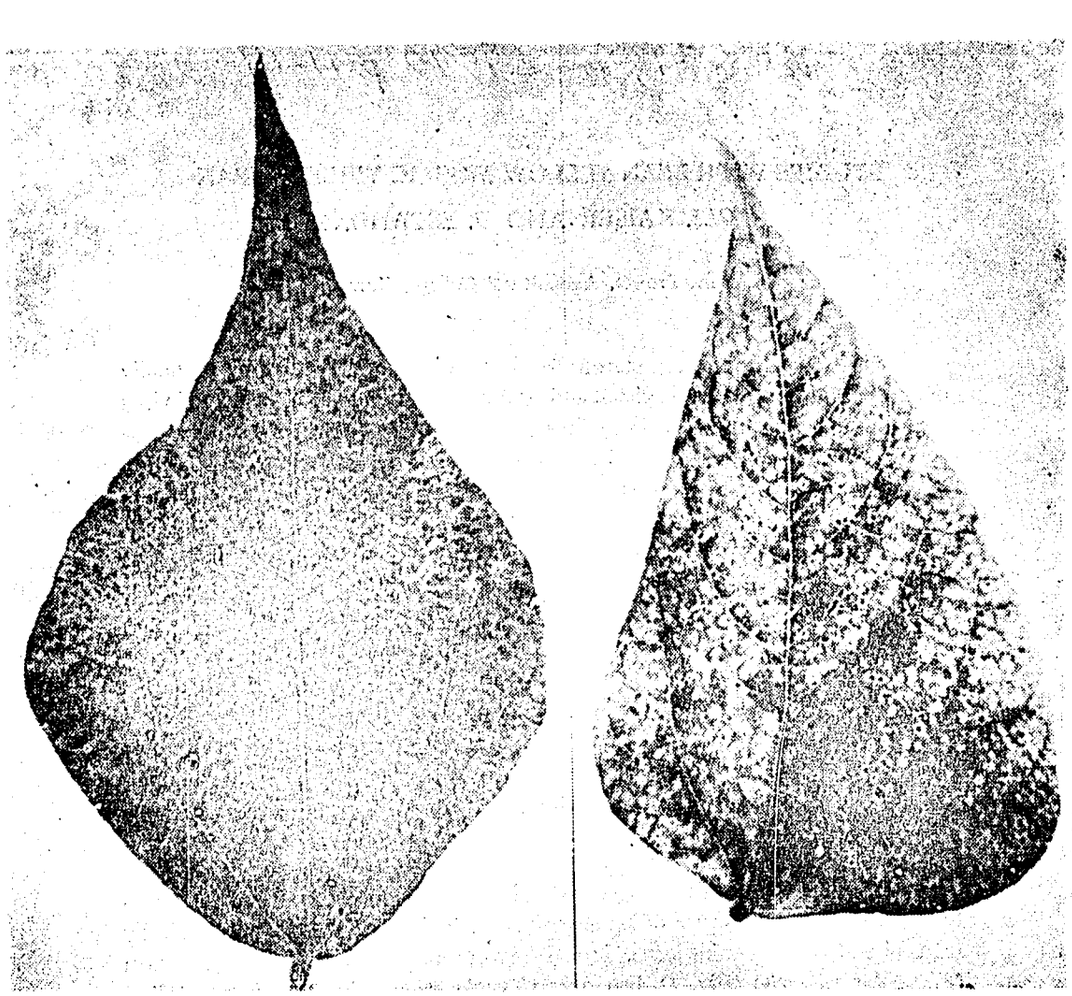
Virus diseases affect numerous food crops in Iran and thereby annually contribute to low and erratic yields and or decreased quality. The effect of virus diseases on several high protein, edible legumes (pulses) is being studied by research scientists associated with the Plulse Project and Plant Protection Department, Karaj Agricultural College. Disease surveys have been made in various regions of Iran to determine the distribution and importance of viruses affecting pulse crops(3). In addition, studies in the field, greenhouse, and laboratory have been initiated to identify these viruses, determine certain of their properties, and to study the field biology and epidemiology of this important group of pathogens.

Our studies have resulted in the identification of at least six different viruses which infect pulses under natural field conditions in Iran (1,3). The host ranges of the different pulse viruses are not necessarily limited to the Leguminosae. Some, like cucumber mosaic virus, cause diseases of numerous economic crops in several plant families.

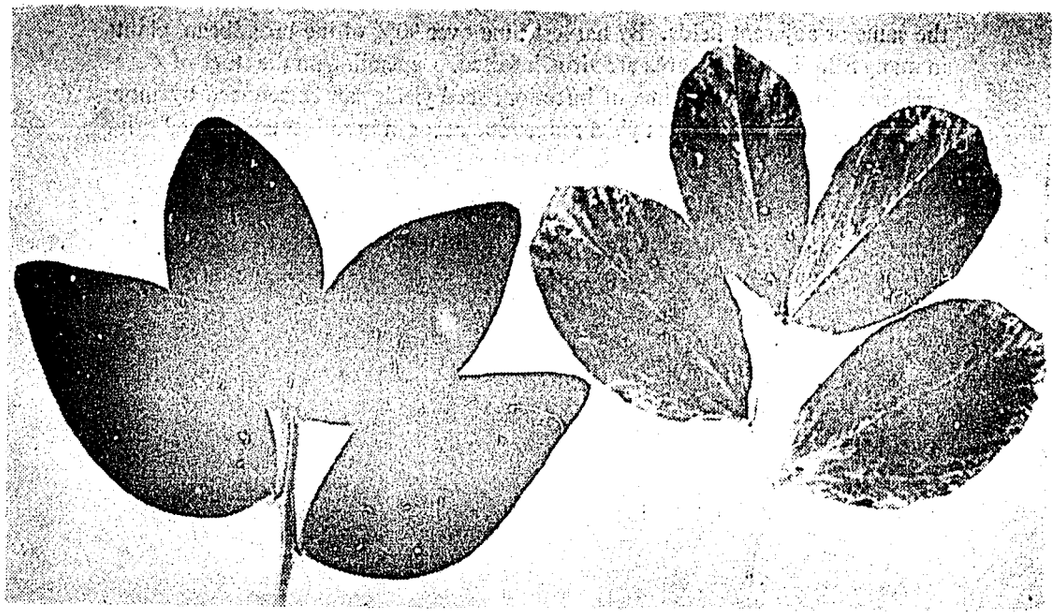
Bean yellow mosaic virus (BYMV)) is one of the most important and widely distributed virus diseases of legumes in Iran. This virus which is mechanically transmissible and aphid-borne, infects several pulse crops, such as bean (*Phaseolus vulgaris*) (Fig. 1), broadbean (*Vicia faba*) (Fig. 2), chickpea (*Cicer arietinum*) (Fig. 3), lentil (*Lens esculenta*), and pea (*Pisum sativum*). Most plants infected by BYMV in Iran, with the exception of *Gladiolus* sp., belong to the Leguminosae. Several strains of the virus affect legumes in various areas of the country. These strains often vary greatly in certain properties, like symptomatology and host range. White sweetclover (*Melilotus alba*) and other uncultivated leguminous plants were found to be important reservoirs and overwintering hosts of BYMV(2).

In nature, BYMV is transmitted from virus-infected hosts to healthy plants by aphids. Different aphid species, including *Acyrthosiphon pisum, A. sesbaniae,*



شکل ۱ــ دونوع علائم موزائیك زردی لوبیا روی دونوع لوبیا

Fig. 1. Different mosaic symptoms often develop on the foliage of bean plants infected with bean yellow mosaic virus depending on the virus strain and/or bean variety (Veriety Wade, left; variety Bountiful, right).



شکل ۲ــ علائم موزائیك روی برگ باقلاکه دراثرآلودگی به ویروس موزائیك زردی لوبیا بوجود آمده. سمت راست برگ سالم.

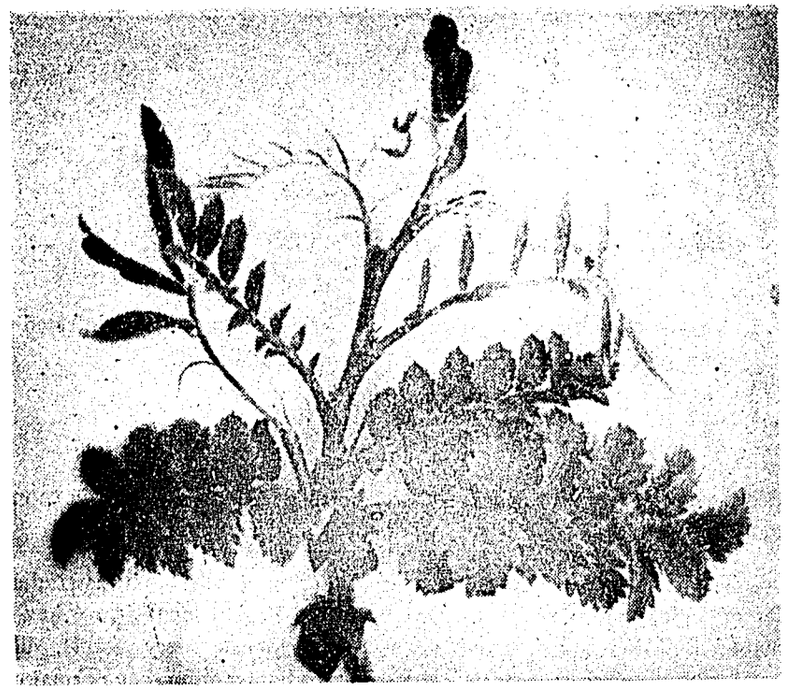
Fig. 2. Mosaic symptoms developing in the foliage of broadbeans infected with bean yellow mosaic virus (right). Healthy leaf, left.

Aphis craccivora, and *Myzus persicae,* transmit BYMV in a styletborne (nonpersistent) manner even with brief proves of less than two minutes(5).

The importance of BYMV in the production of pulses is being studied in different regions of Iran. In the Dez Irrigation Project located in Khuzestan Province, BYMV is an important disease of broadbeans every year(4). Plants infected with the virus are generally stunted and a lighter green than normal ones. Mosaic symptoms appear in the foliage of virus-infected plants 7-15 days after inoculation. BYMV is spread within and between adjacent broadbean plantings by aphids. BYMV is seldom reported to be transmitted in the seeds of virus-infected pulse crops(6). However, in Iran the virus is seed-borne in broadbeans (Table 1' Fig. 4), although only in a small percentage of the seeds(1). Seed transmission is extremely important in the establishment of BYMV in new plantings and movement of the virus to different areas. Aphids, especially winged (alate) forms, transfer BYMV from virus-infected seedlings to healthy broadbeans in

the same or adjacent fields. By harvest time over 90% of the broadbean plants in many fields in the Dez area are virus-infected. Depending on the stage of development of plants at the time of infection, seed yields can be reduced by more than 40% (Table 1). Largest yield reductions occur in broadbeans infected prior to pod set.

Various techniques have been utilized in the identification of viruses affecting pulses in Iran. These include symptomatology, host range studies, physical property tests, vector-virus relationships, serology, and electron microscopy. Leaf dip preparations which were prepared from epidermal strips of virus-



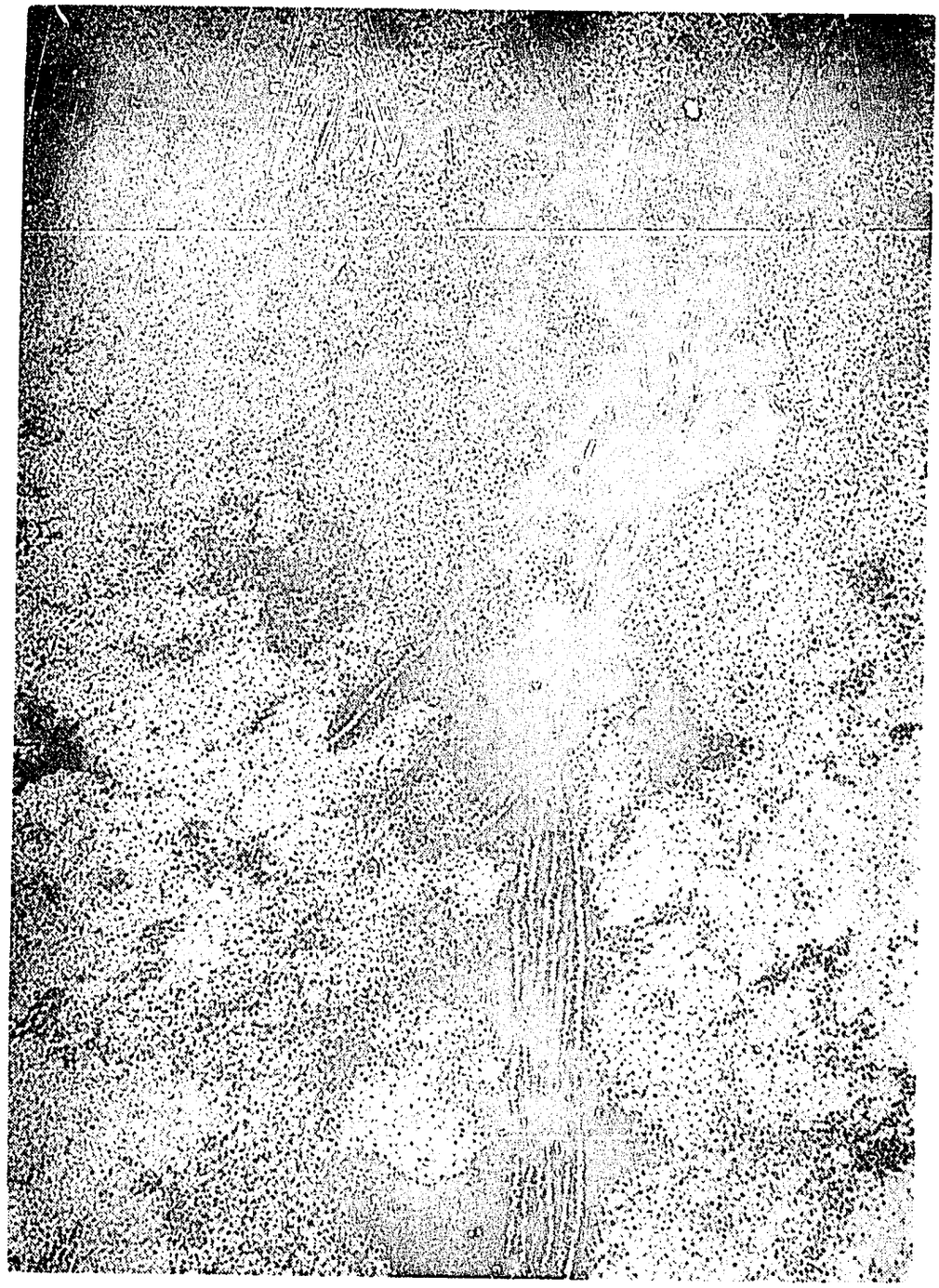
شکل ۳ــ برگچه‌های تغییرشکل‌یافته پرمانند در بوته نخود ایرانی در اثرنژادی از ویروس موزائیك زردی لوبیا.

Fig. 3. Feathery, deformed leaflets in chickpea plants inoculated with some atrains of bean yellow mosaic virus. Infected plants are stunted and chlorotic.

شکل ۴ــ علائم موزائیك زردی لوبیا درگیاهچه باقلاکه از راه بذرآلوده بوجود آمده
(بوته بالائی سمت راست).

Fig. 4. Mosaic symptoms in a broadbean seedling (upper right) infected from seed with bean yellow mosaic virus.

infected broadbean leaves negatively stained with phosphotungstic acid and observed with the electron microscope at Karaj Agricultural College, have revealed that the virus particles from broadbean plants infected from seed were long, flexuous rods, approximately 750 m. microxsc in length (Fig.5). Electron microscopy has proved to be a very useful tool in the identification of viruses from naturally infected plants, especially with rod-shaped viruses, like BYMV.



شکل ۵ــ رشته‌های موزائیك زردی لوبیا در عکس از میکرسکپ الکترونی که حدود ۱۰۰ هزار مرتبه بزرگ شده است.

Fig. 5. An electron micrograph of rod-shaped virus particles, appoximately 750 mi in length (magnified about 100,000 times), of bean yellow mosaic virus from broadbean. The preparation was made by using a leaf dip technique and negatively staining with phosphotungstic acid.

Table 1. Effect of bean yellow mosaic virus on yields and seed transmission in broadbean (*Vicia faba*) inoculated at different stages of plant development.

Stage of Plant Growth When Inoculated *a*	Yield *b*	% Decreace	Seed Transmission		
			No. Seedlings	No. Virus Infected	% Transmission
Not Inoculated	1950	—	1178	0	0
Pre-Bloom	1821	42	794	2	0.à5
Full Bloom	1098	44	1160	11	0.95
Post Bloom	1511	23	1065	2	0.19

a) Pre-bloom, full bloom and post bloom treateents were inoculated with virus 42, 62, and 77 days after planting, respectively. Plots were harvested 106 days after planting.

b) Yield of dry seeds (grams) from 100 plants.

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