CHANGES IN AGRONOMIC CHARACTERISTICS AND CONTENT OF MUNG BEAN (Phaseolus aureus Roxb.) INFECTED WITH ARHAR MOSAIC VIRUS

by R. Singh and T. P. Mall

INTRODUCTION

During studies on the virus diseases of leguminous crops, it has been observed that the two viruses which were originally isolated from field grown arhar (Cajanus Cajan (L.) Mill.) plants, seemed to be strains of arhar mosaic virus, causing growth reduction and damage to the yield of mung bean. As mung bean is considered to be a good feed for human and cattle consumption, due to its high protein content, it was aimed in the present study to see the effect of the arhar mosaic virus isolates on the protein contents and agronomic characteristics of the infected mung plants in green-house conditions.

MATERIALS AND METHODS

Arhar mosaic virus isolates ASM and AMM obtained from the culture maintained on the arhar cv. S-8 in the Departmental glass house and the mung bean cv. Sheela seeds for the study was obtained from U.P. Institute of Agriculture Sciences, Kanpur. The seed of mung cultivar Sheela was grown at the rate of one plant, per clay pot (10 cm size) in a mixture of soil, sand and compost (1: 1: 1). One hundred and fifty seedlings of the same size were selected and divided into three groups of 50 seedling each. Ist and 2nd groups of seedlings were inoculated at the age of 7 days with crude extract of ASM and AMM isolates respectively. The extract was prepared by grinding infected leaves of arhar. Before inoculation, the mung bean leaves were dusted with 400-mesh carborundum. After inoculation leaves were rinsed with water. The plants of 3rd group was left as control.

The mung bean plants were harvested after two months from the date of inoculation. At the time of harvest, the growth data were taken as described by Singh and Bhargava (1965). The moisture content was determined by differences

* Department of Botany, The University of Gorakhpur (V.P.) India. Received for publications July 30/73.

between fresh and dry weight of the samples and was expressed as the percentage of fresh weight. For yield determination, the number, and pod size, no. of seed per pod and seed weight was also recorded just after harvest. The total protein content of leaf, stem, root and seed was estimated from dried plant material. The dried samples were ground in 10 percent tri-chloro-acetic acid in a mortar. The homogenate was centrifuged at 15,000 r.p.m. and the precipitate was used for determining the organic nitrogen by the procedure described for total nitrogen (Snell, 1949). The protein content of the material was calculated for the organic nitrogen by multiplying with factor 6.25.

RESULTS

The findings (Table 1) indicate that the arhar mosaic virus isolate ASM is more severe than the AMM, in its reaction to the mung cu. sheela. The virus causes a reduction in shoot height and root length, fresh and dry weights, in infected plants. The moisture percentage was more in infected mung plant samples, then their healthy counterparts. The protein content of healthy plant parts is more higher than the diseased plants. The seed protein was highest followed by leaf, stem and root. The virus infection lowered the protein contents of the seed, leaf and stem, but no quantitive change was noted in the roots of healthy and AMM isolate infected mung plants.

DISCUSSION

The arhar mosaic virus isolates in general influenced the growth, dry weight and moisture level of the host plant. Infected plants have lesser fresh and dry weight but a higher moisture contents. Similar results are also reported by different workers with several virus infected leguminous plants (Harrison, 1935; Chant, 1960 and Reddy and Chenulu, 1966). Selman (1941) was of the opinion that virus diseases, in general, tended to reduce the water content in initial stages above the healthy plants due to decreased permeability of the cell. The loss in yield as evidenced by pod number, size. Seed number and seed weight (Table 1) seems to be quite similar to the effect of other virus disease described on mung. Nariani (1960) and Nene (1969) found mung bean plants infected with yellow mosaic virus, had very few pods. They also reported that the size of the pods was reduced and more frequently, small sized seeds were obtained from the pods of diseased plants. The higher protein percentage was recorded in plant parts of healthy plants in comparison to diseased mung plant parts (Table 2). The protein percentage was same in healthy and AMM isolate infected mung bean roots. Orlob and Arney (1961) reported that the diseased in total protein is due to the inhibition of protein synthesis and increased rate of degradation of leaf protein in infected plants.

SUMMARY

Changes in agronomic characteristics and protein contents of mung bean

TABLE I – EFFECT OF ARHAR MOSAIC VIRUS ON THE GROWTH AND YIELD OF MUNG BEAN CULTIVAR

Height of shoot (cm.)	Healthy	27.66	
	ASM	23.625	– 14.58
	AMM	25.550	– 07.62
Length of root (cm.)	Healthy	10.00	
	ASM	05.37	– 46.30
	AMM	08.40	– 16.00
Fresh wt. of shoot (g.)	Healthy	5.072	
	ASM	3.650	– 28.03
	AMM	3.775	– 25.57
Fresh wt. of root (g.)	Healthy	0.4700	
	ASM	0.1775	– 62.20
	AMM	0.1790	– 69.91
Dry wt. of shoot (g.)	Healthy	1.266	
	ASM	0.960	– 24.17
	AMM	0.895	– 29.304
Dry wt. of root (g.)	Healthy	0.166	
	ASM	0.080	– 51.80
	AMM	0.059	– 64.16
% Moisture content of shoot	Healthy	75.03	
	ASM	73.60	– 1.90
	AMM	76.10	+ 1.42
% Moisture content root	Healthy	68.9	
	ASM	54.8	– 20.40
	AMM	66.7	– 3.19
No. of pods/plant	Healthy	4	
	ASM	3	– 25.0
	AMM	2.8	– 30.0
Length of pods (cm)	Healthy	6.14	
	ASM	5.48	– 10.74
	AMM	5.76	– 6.19
No. of seed/pod	Healthy	6.90	
	ASM	5.75	– 16.66
	AMM	6.50	– 05.79
Fresh/seed (g.)	Healthy	0.033	
	ASM	0.027	– 18.18
	AMM	0.032	– 03.03
Dry wt/seed (g.)	Healthy	0.029	
	ASM	0.0245	– 15.517
	AMM	0.0276	– 4.83
Moisture content of seed	Healthy	12.1	
	ASM	9.2	– 23.966
	AMM	13.7	– 13.22
Volume/seed (ml)	Healthy	0.026	
	ASM	0.024	– 7.69
	AMM	0.025	– 3.84

Percentage (+) increase of (–) decrease over healthy.

(**Phaseolus aureus** Roxb.) cv. Sheela as influenced by arhar mosaic virus isolates (ASM and AMM) infection was studied. Isolate ASM was causing more reduction in growth and yield in comparison to AMM isolate. Infected plant samples have lower dry weight but higher moisture contents in comparison to their healthy counterparts. The protein content was higher in healthy mung parts than virus isolate infected mung plant parts. The protein contents was highest in seed, followed by leaf, stem and root. Virus infection reduced the protein percentage in seed, leaf, and stem but it was same in healthy and AMM isolate infected mung root.

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TABLE II – EFFECT OF ARHAR MOSAIC VIRUS ON THE % PROTEIN CONTENT (DRY WEIGHT BASIS) OF MUNG BEAN PLANT PARTS

PLANT PART		PROTEIN	% Increase (+) or decrease (–) over healthy
Seed	Healthy	16.256	
	ASM	15.488	– 4.72
	AMM	14.848	– 8.72
Root	Healthy	6.784	
	ASM	5.376	– 2.75
	AMM	6.784	– 00.00
Stem	Healthy	6.784	
	ASM	4.736	– 3.18
	AMM	5.376	– 2.75
Leaf	Healthy	10.624	
	ASM	8.192	– 13.47
	AMM	10.624	– 00.00

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