

Original Research Article

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Symptomatology Studies of Soybean Mosaic Disease

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ABSTRACT

Keywords

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Under field conditions, *Soybean mosaic virus* infected plants exhibited the major symptoms viz., mosaic and mottling, crinkling, leaf puckering, dwarfing and younger leaves showed clear mosaic symptoms etc. The SMV Infected plants showed considerable reduction in plant height, pod length, grains per pod and pods per plant that leads to considerable reduction in the economic yield. The SMV was readily sap transmissible to cv. JS-335 when the inoculum was prepared in 0.1 M phosphate buffer (pH 7.0) and produce typical symptoms such as mottling, crinkling of leaves, leaf puckering and dwarfing.

Introduction

Soybean [*Glycine max* (L.) Merrill], 'Queen of Pulses', a native of Eastern Asia belongs to the family Leguminosae, subfamily Papilionoideae and tribe Phaseolae. Soybean is considered as a 'Golden bean', 'Miracle bean', 'Agriculture's Cinderella' and Wonder crop' of the 20th Century' due to its qualities such as high protein (40%), good amount of carbohydrates (35 0/0), oil (20%) and ash (5%) content on oven dry basis. Soybean is known to be naturally infected by at least 50 viral diseases belonging to different groups (Sinclair, 1992). In India, so far 11 viruses have been reported to occur on soybean (Mali, 1995). Among the viral diseases, soybean mosaic virus (SMV) (Mali, 1995) seems to be much of prevalence. Clinton (1915) reported the occurrence of soybean mosaic virus for the first time in world. In

India the occurrence of soybean mosaic virus was reported from New Delhi by Nariani and Pingaley (1960). Later its occurrence was reported from Tamil Nadu (Usman *et al.*, 1973), Uttar Pradesh (Singh *et al.*, 1976) and Karnataka (Naik and Murthy, 1992). The primary leaves of infected plant curled down words, petioles and internodes shortened and plants were highly stunted. The virus was established on glasshouse grown soybean plants variety JS-335 by mechanical inoculation. Results of detailed studies made on this disease are reported in this paper.

Materials and Methods

For symptomatology studies soybean cv. JS-335 was inoculated with SMV inoculum by following mechanical inoculation

technique. The soybean plants showing typical mosaic, mottling, curling, less pubescent, puckering symptoms were collected from the fields and the samples were kept at -80°C in plastic bags in deep freeze with proper labels. All frozen samples were then mechanically inoculated on propagation hosts. Frozen leaves were ground using chilled mortars and pestles in 0.1M Phosphate buffer (pH 7.4), containing 0.2% Sodium sulphite and 0.01M β-Mercaptoethanol. The fully grown leaves from six week old soybean cv JS-335 plants were rubbed with carborandum before being gently rubbed with the inoculums. Inoculated leaves were rinsed with tap water to remove the excess inoculum. The inoculated plants were maintained in glasshouse and observed regularly for symptom development. Observations were recorded on type and severity of symptoms and time taken for symptom development. The symptoms of virus infected symptomatic soybean plants under field conditions were observed. The differences between symptomatic and asymptomatic soybean plants based on their symptoms were studied under field conditions.

Results and Discussion

Symptoms of SMV observed were stunted plant growth, fewer pods that are sometimes dwarfed and flattened, without hairs and seeds. Trifoliate leaves exhibited mosaic with light and dark green areas that may become blistered or raised, particularly along the main veins. Leaves distorted, generally with the leaf margins curling downward. Primary leaves of some cultivars may show necrotic local lesions, which merge into veinal necrosis, followed by yellowing and leaf abscission (Fig. 1). These symptoms are similar to the findings of Byadgi *et al.*, (2005), Baswaraj Raigond (2013), Balgude *et al.*, (2012) and Amrita Banerjee *et al.*, (2014).

All the plants of soybean cv. JS-335, inoculated by following sap inoculation technique, showed light and dark green mosaic on upper leaves after 10-14 days of inoculation. In extreme cases leaves were dark green with vein clearing of the leaves. Leaf margins were curved downward at the sides.

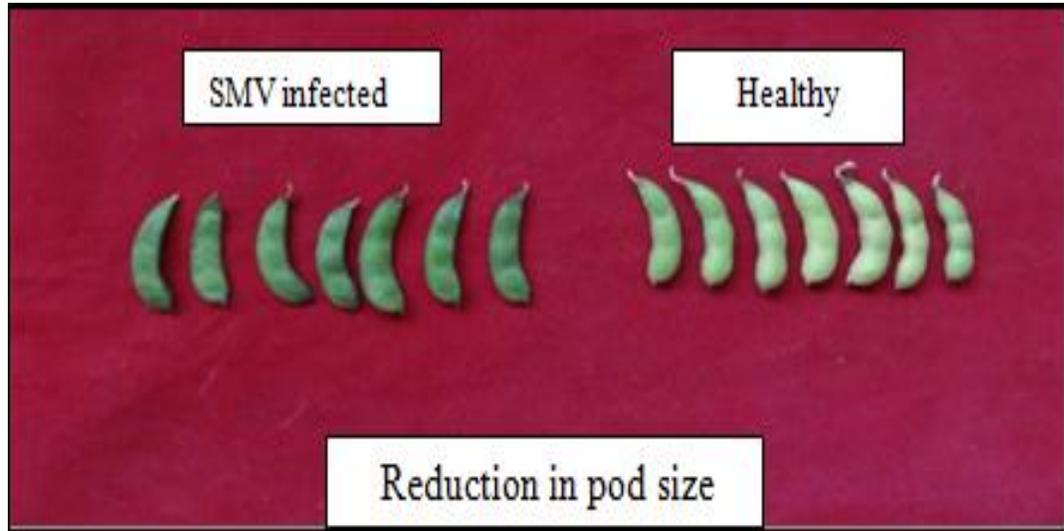
Table.1 Comparison of symptomatic and asymptomatic plants based on pod length, test weight, plant height, grains per pod and pods per plant

Sr. No.	Samples	Pod length (cm)	100 grains weight (gms)	Plant height(cm)	Grains per pod	Pods per plant
1	Asymptomatic	5.6 cm	15.20	45 cm	6	25
	Symptomatic	3.2 cm	12.90	30 cm	3	22
2	Asymptomatic	5.8 cm	15.90	40 cm	8	26
	Symptomatic	3.5 cm	13.15	25 cm	5	19
3	Asymptomatic	6 cm	14.20	45 cm	6	22
	Symptomatic	4 cm	11.21	25 cm	3	15
4	Asymptomatic	6.5 cm	16.10	35 cm	5	18
	Symptomatic	4 cm	12.88	15 cm	3	14
5	Asymptomatic	6.2 cm	15.80	50 cm	6	20
	Symptomatic	4.8 cm	13.11	39 cm	3	11

Figure.1 Soybean plants showing different symptoms after inoculation with SMV







Affected leaves were coarse, leathery to touch and somewhat brittle at maturity. Symptoms began to vanish on ageing and older leaves remained symptomless. The infected plants were stunted growth with reduction in leaf size and also reduction in pod size.

Data in table 1 showed that Asymptomatic plants produced healthy pods with maximum yield (90%) but in symptomatic plants pod formation was greatly reduced with stunted growth. Symptomatic plants were dark green

with mosaic, leaf distortion, light and dark green mosaic, dark green with vein clearing and in severe condition yield losses around 90%. Where asymptomatic plants produced a large minority of three-seeded pods (34.2%), a majority (54.5%) of two-seeded pods and only 9.2% of single-seeded pods, in contrast, a symptomatic plant produced either no pods at all, or a highly reduced *i.e.* 7.5% of three-seeded pods, 15.2% of two-seeded and 8.3% of single-seeded pods. Asymptomatic plants produced very few sterile pods per plant

(almost 2.2%), but symptomatic plants had 77.3% sterile or empty pods per plant, the main cause of severe yield losses.

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