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Influence of Total Soluble Protein and Total Soluble Sugar on Incidence of Bruchid (*Callosobruchus Theobromae* L.) on Selected Fieldbean Accessions

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ABSTRACT

The total soluble protein and total soluble sugar content exhibited positive correlation with infestation of bruchid *(Callosobruchus theobromae* L.*)* population on fieldbean. The tolerant accession GL-164 recorded the lowest 121.6 and 134.4mg/g total soluble protein, and total soluble sugars content of 18 and 28mg/g, in pod wall and seeds respectively. Whereas the susceptible HA-4 accession was recorded high total soluble protein content of 65 and 85 mg/g, and total soluble sugar content of 43 and 61mg/g in pod wall and seeds respectively.

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Keywords: C*allosobruchus theobromae L.* fieldbean, Total soluble protein, *T*otal soluble sugars.

INTRODUCTION

Fieldbean, *Lablab purpureas* L. is also called dolichos bean or hyacinth bean, (family: Fabaceae) is a native of India and is presently grown throughout the tropical parts of Asia, Africa, West Indies, China and India. The crop is mainly grown for its fresh green pods used as vegetable and dry seeds for preparation of dishes and while dry matter is used as fodder for livestock.

More than 150 species of insect pests are known to cause damage to this crop in field and storage (Southgate, 1979). Among these insect pests, bruchids assume greater importance as they damage the final produce in the field and store house. In controlling this pest effectively by insecticidal application alone is not safe and economical. Host plant resistance is one of the most viable components of integrated pest management. Various biochemical compounds present in the plant parts play an important role in offering host plant resistance in suppressing the pest. Thus, the present study was undertaken to investigate the role of bio-chemical constituents such as total souble proteins and total soluble sugars in field bean against infestation of bruchids.

MATERIAL AND METHODS

The present investigation was conducted during 2009-2010 at the All India Co-ordinated Research project on pigeonpea, University of Agricultural Sciences, GKVK, Bangalore. Forty accessions were collected and sown in two lines of three meter length as unreplicated. All the agronomic practices were followed as per the package of practices except the plant protection measures. Per cent pod infestation of fieldbean was recorded by taking pods from five plants randomly from each accession after harvest of the crop. Per cent pod infestation was computed by using the standard formula

$$\% \text{ Pod infestation} = \frac{\text{Number of pods damaged}}{\text{Total number of pods in Sample}} \times 100$$

Estimation of biochemical constituents were done as per standard procedure followed by Lowry *et al*.,

1951 for total soluble proteins and Dubois *et al*., 1956 for total soluble sugars. The SDS- PAGE of soluble seed protein was performed as per the method described by Laemmli (1970).

OBSERVATION, RESULT AND DISCUSSION

The bruchid incidence in 40 test accessions ranged from 1.25 to 36.84 per cent. Ten accessions were selected (which had shown some sort of tolerance/susceptibility to the bruchid) for the analysis of chemical constituents of total proteins and total sugars. The correlation between bruchid infestation and total soluble protein and total soluble sugar content in the pod wall and seeds of different accessions was positively significant (Table 1) which indicating that increase in soluble protein and total soluble sugar content resulted in more infestation.

In the tolerant group, the total soluble protein content was lower in both pod wall and seeds and the total soluble protein content was highest in seeds followed by pod walls in susceptible accessions. In tolerant group, the accession GL164 was significantly superior over all other accessions which was having an soluble protein content of 129.6 & 48.4 mg/g in seed and pod wall respectively followed by GL187 (134.4 &121.6 mg/g), GL63 (144 & 129.6 mg/g) GL195 (152.8 & 136 mg/g) and GL127 (159.6 & 150.4 mg/g). In the susceptible group, the soluble protein was higher in both the plant parts. In pod wall and seeds, the total soluble protein content was highest in seeds followed by pods. The accession, HA4 which had highest infestation of bruchid was having soluble protein content of 195.2 & 171.2 mg per g in seed and pod wall respectively followed by *HA3* (195.2 &185.6 mg/g), GL102 (195.2 & 144 mg/g), GL46 (190.4 & 129.6 mg/g) and the lowest total soluble protein content was found in GL36 (171.2, 96.0 mg/g) (Table 2). The electrophoregram of SDS-PAGE banding patterns of soluble seed protein profiles showed variations with regard to the bands and intensity among the accessions of fieldbean infested by the bruchid, *C. theobromae* (Plate I). The tolerant varieties, namely GL-164, GL-187, GL-63, GL-195 and GL-127 showed a maximum of 2, 3, 5, 3 and 9 bands, respectively while the susceptible ones namely, GL-36, GL-46 GL-102 HA-3 and HA-4 have shown a maximum of 11, 10, 9, 11 and 8 bands each. Bands 6 to 7 were commonly present in all the ten accessions. Bands 9, 6, 10, 13 and 12 were present with dark intensity in the susceptible group while the band 7 was with dark intensity in the tolerant groups. Variations in number and intensity of total soluble seed protein bands upon attack of insects as characterized by SDA-PAGE were also reported by Girish (2005) in fieldbean against Pod borers attacks.

In the tolerant group, the soluble sugar content was lower in a both the plant parts. Among the plant parts, the soluble sugar content was highest in the seeds followed by pods. GL164 recorded 28 & 18 mg per g, GL187 (31 & 20 mg/g), GL63 (49 &27 mg/g) GL195 (62 & 29 mg/g) while GL127 (62 & 45 mg/g) recorded of soluble sugar content in pod wall and seeds, respectively (Table 2). In the susceptible group, the soluble sugar was higher in both the plant parts. Pod wall and seeds, the soluble sugar content was highest in seeds followed by pods. The accession GL36 was having 65 & 50 mg per g, GL46 (67 & 58 mg/g) GL102 (77 &57 mg/g) HA3 (84 & 61 mg/g) while *HA4* was having 85 & 65 mg per g of soluble sugar content in pod wall and seeds respectively (Table 2). Girish (2005) also reported relatively less levels of the total soluble sugar as well as reducing sugar in the resistant accessions in comparison to the susceptible ones of fieldbean.

Table 1: Correlation between biochemical parameters and pod damage in selected fieldbean accessions

Corrélation coefficients (r) at 5%		
Biochemical parameters	**Pod wall**	**Seeds**
Total soluble protein	0.5447*	0.9586*
Total soluble sugar content	0.9464*	0.8658*

*Correlation is significant at 0.05 levels

Table 2: The activities of enzymes, peroxidase and phenylalanine ammonia lyase (PAL) in selected fieldbean accessions

	Sl. No	Accessions	Total soluble protein content (mg/g)		Total soluble sugar content (mg/g)	
			Pod wall	Mature seeds	Pod wall	Mature seeds
Tolerant groups	1	GL-164	48.4 (6.99)[a]	129.6 (11.41)[a]	18 (4.03)[a]	28 (5.29)[a]
	2	GL-187	121.6 (11.05)[b]	134.4 (11.62)[b]	20 (4.48)[a]	31 (5.55)[a]
	3	GL-63	129.6 (11.41)[c]	144 (12.02)[c]	27 (5.19)[b]	49 (6.99)[b]
	4	GL-195	136 (11.68)[dg]	152.8 (12.38)[d]	29 (5.39)[b]	62 (7.83)[c]
	5	GL-127	150.4 (12.28)[e]	159.6 (12.65)[e]	45 (6.72)[c]	62 (7.90)[c]
Susceptible groups	6	GL-36	96 (9.82)[f]	171.2 (13.10)[f]	50 (7.06)[c]	65 (8.08)[c]
	7	GL-46	129.6 (11.41)[dg]	190.4 (13.82)[g]	58 (7.61)[d]	67 (8.15)[c]
	8	GL-102	144 (12.02)[g]	195.2 (13.99)[h]	57 (7.66)[de]	77 (8.77)[d]
	9	HA-3	171.2 (13.10)[h]	195.2 (13.99)[h]	61 (7.79)[de]	84 (9.15)[e]
	10	HA-4	185.6 (13.64)[i]	195.2 (13.99)[h]	65 (8.02)[e]	85 (9.20)[e]
Tolerant Group Mean			**117.2**	**143.4**	**27.8**	**46.4**
Susceptible Group Mean			**145.3**	**189.44**	**58.2**	**75.6**
Overall Mean			**121.04**	**166.76**	**43**	**61**
F'-test			*	*	*	*
SEM ±			**0.0194**	**0.0235**	**0.0700**	**0.069**
CD @ p=0.05			**0.1020**	**0.1216**	**0.3607**	**0.3584**

√x+.05 transformed values are presented in parenthesis
***** Significant at p=0.05

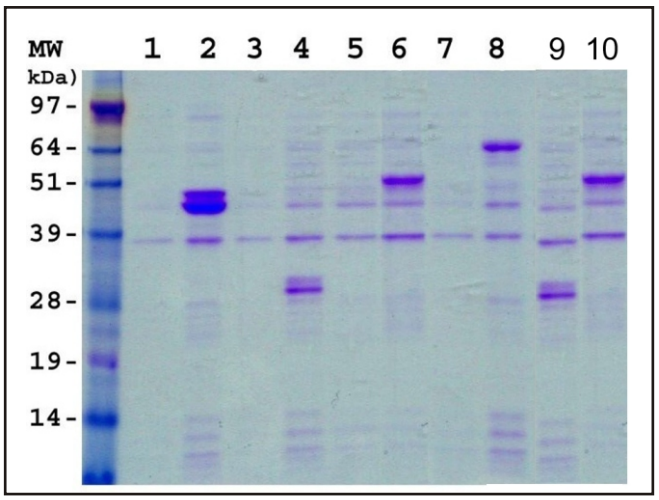

Figure 1: SDS-PAGE banding patterns of soluble seed proteins in selected fieldbean accessions - **1.GL-164 2.GL-36 3.GL-187 4.GL-46 5.GL-63 6.GL-102 7.GL-195 8.HA-3 9.GL-127 10.HA-4**

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