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Host Plant Resistance Mechanism to Podborer (*Helicoverpa armigera*) in Pigeonpea

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Abstract: In the present research, we studied the presence of phenolic acids in seeds of pigeon pea. Phenols extracted from seeds were analyzed by HPLC. Among the three phenols identified (Benzoic acid, Paranitro phenol and Orcinol) in different generations of pigeon pea. Concentrations of phenols were higher in tolerant cultivar (ICP 13201) than susceptible (CO5). While comparing three phenols amount of orcinol was higher than that of other two phenols. The difference was not very sharp for benzoic acid.

Key words: *Cajanus cajan*, *Helicoverpa armigera*, HPLC, Host plant resistance, Phenols, Pigeon pea seeds

INTRODUCTION

Helicoverpa armigera Hubner is a serious pest of pigeonpea (*Cajanus cajan* (*L.*) *Mill* sp. and it accounts to yield losses ranges from 3-100% (Sharma *et al*., 2001) Volatile chemical present in pigeonpea are known to play an important role in host plant recognition by pod borer. Pod washings and extracts of essential oils from the leaves of certain pigeonpea cultivars had shown that some volatile substances attracted the podborer moths for its ovi-position (ICRISAT, 1983). The resistant genotypes had high amount of terpenoids and volatiles than the susceptible genotypes. Less susceptibility of pigeonpea genotypes was thought to be associated with more polyphenol content (Sithanathan *et al*., 1980). The studies on biochemical characters of pigeonpea pod walls in relation to pod fly susceptibility showed that wax, phenol, Proline and total free soluble sugars were negatively correlated. The phenolic compounds are known to affect the digestibility and may act as a dosage dependent defuse against insect pests in plant.

However the morphological and biochemical basis of resistance in wild species is little understood. In the present study role of phenolic acids importing resistance to *Helicoverpa armigera* have been assessed.

MATERIALS AND METHODS

The study was carried out at Tamilnadu Agricultural University, Coimbatore during Rabi 2003. ICP 13201 as podborer tolerant and CO5 as podborer susceptible lines were used in hybridization programme. Three different phenolic acids were estimated by HPLC (High Performance Liquid Chromatography) technique in parental lines and their F_1 and F_2 plants. The phenol were extracted by the following procedure as described by Carpentier and Cowle (1981). The qualitative determination was done by comparing the retention time of the known and unknown peaks.

RESULTS AND DISCUSSION

The physiological state of the *Helicoverpa armigera* females influences the host plant specifying and propensity (Mustapha *et al*., 1998).

The optimum separation of three phenolic acids was achieved in the order of decreasing polarity typical of reverse phase chromatography. The amount of individual phenolic acids varied with each genotype.

Among the three phenolic acids identified (Table 1) two were present in CO5 . Orcinol was present in trace amount in CO5.However, the amount of phenolics were higher in tolerant lines when compare to susceptible. This was in accordance with the findings of Green *et al.* (2003) they reported that *Cajanus cajan* cultivars that varied in their susceptibility to *Helicoverpa armigera* were showed for their presence of four phenolic compounds.

Table 1: Concentrations (mg/dry leaf) of different phenolic acids in pigeonpea

Generation (Retention Time)	Benzoic acid (6.688)	Paranitro phenol (3.989)	Orcinol (3.753)	Total
P_1	22.58	21.26	57.87	101.71
P_2	21.38	0.00	2.34	23.72
F_1	39.26	14.85	55.75	109.86
F_2	6.85	7.13	24.06	38.04
BC_1F_1	3.37	13.39	50.34	67.10
BC_2F_1	1.85	7.53	33.57	42.95

P_1 = (ICP 13201), p_2 = (CO5), F_1 = (ICP 13201 x CO5), BC_1F_1 = (ICP 13201 x CO5) x (ICP 13201), BC_2F_1 = (ICP 13201 x CO5) x CO5

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Higher concentration o f phenols was observed in pod borer resistant cultivars than the cultivated variety. However, in contradictory methanol extracts from *Cajanus scarabaeoides* pods showed no such effect (Sharma *et al*., 2001).

The F_1 between these two parents exhibited heterosis for the concentration of phenolic acids. The average concentration of different phenolic acids of susceptible and resistance lines for *Helicoverpa armigera* indicated that concentration of all phenolics were higher in tolerant as compare to susceptible plants. The differences were not very sharp for benzoic acid.

The phenolic compounds are known to affect the digestability and may act as a dosage dependent defence against insect-pests in plant.

According to Verulkar and Singh (2000) Mechanism of resistance to pod borer in pigeon pea was studied using pant A-3 and wild species *C. scarabaeoides*. HPLC technique was used to study the phenolic contents in the parents, F1 and F2 plants. Vanillin acid, Syringic acid and Protocatechuic acid showed a high correlation with pod borer resistance.

Pichare and Kachole (1996) reported plant protease inhibitors viz., trypsin and chymotrypsin play a vital role in defense against insect pest of pigeon pea pod borer.

In this present study the total concentration of different phenols were higher in pod borer tolerant (ICP 13201) than susceptible (CO5) cultivar.

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