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Influence of arbuscular mycorrhizal fungi and bio-inoculants on host plant resistance *Antigastra catalaunalis* Duponchel in sesame *Sesamum indicum* Linn.

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ABSTRACT

Expression of insect resistance in crop plants is being influenced and / or induced by external factors, especially the nutrient sources. Many bio-inoculants as nutrient sources influence insect resistance in crop plants. Hence, an attempt was made to study the influence of arbuscular mycorrhizae and other bioinoculants in influencing insect resistance in sesame, *Sesamum indicum* Linn. against *Antigastra catalaunalis* Duponchel (Lepidoptera: Pyraustidae). The five promising accessions sown in field plots were applied with the four bioinoculants and for comparison, recommended dose of inorganic fertilizers, NPK was supplied in a separate plot besides maintaining a untreated control plot without any nutrition. The damage caused by *A. catalaunalis* to leaves, flowers and capsules and seed yield at harvest were recorded. Among the accessions tested, IVTS 2001-26 recorded the minimum damage by *A. catalaunalis*. Irrespective of the accessions, *Azospirillum* applied plants recorded the minimum leaf damage while flower damage was least in farm yard manure applied plants. Capsules of plants applied with either *Azospirillum* or farm yard manure were undamaged. Seed yield was the highest in inorganic fertilizer applied plants. Hence, it is concluded that bioinoculants increase host plant resistance as well as yield compared to with inorganic fertilizers.

Keywords: Sesame, *Sesamum indicum*, Bio-inoculants, insect resistance

INTRODUCTION

Sesame (*Sesamum indicum* L.) an important oilseed crop is cultivated widely in rainfed or resource poor areas in South India wherein insect pests inflict heavy yield loss. Among the insect pests that ravage sesame, shoot webber and capsule borer, *Antigastra catalaunalis* Duponchel (Pyraustidae: Lepidoptera) causes severe yield loss (Balaji, 2006) necessitating an effective integrated management strategy. Though insecticides are effective (Ahirwar ***et al.***, 2008), host plant resistance in sesame gene pool, if exploited, will be an economically viable and eco-friendly approach. The sesame accessions found promising against *A. catalaunalis* possessed denser trichomes and also favourable biochemical constitution (Balaji, 2006). Expression of such resistance in crop plants to insects is being influenced and or induced by external factors such as nutrient sources. Keeping this in view, a field study was conducted to analyse the influence of arbuscular mycorr hizae and other bio-inoculants in comparison with fertilizers on insect resistance in selected sesame accessions.

MATERIALS AND METHODS

By preliminary field and laboratory screening of 47 sesame accessions for resistance against *A. catalaunalis*, five accessions namely, IVTS-2001-20, IVTS-2001-23, IVTS-2001-24, IVTS-2001-25 and IVTS-2001-26 were selected (Vijai Anandh, 2003) for this study. These five accessions along with a susceptible check, IVTS-2001-19 were sown in plots of 2.5 x 2.5 m size in six rows @ one row per accession. The bio-inoculants such as arbuscular mycorrhizal (AM) fungi (*Glomus fasciculatum*) (785 g soil inoculum/plot), *Azospirillum* (15.6 g /plot) and phosphobacteria (15.6 g /plot) were mixed with one kg of FYM and then incorporated in each plot prior to sowing. Farm yard manure was incorporated at the rate of 12.5 t/ ha. A set of plants were applied with recommended dose of the fertilizers (N:P:K @ 38: 23: 23 kg /ha as a comparison). A untreated control without any nutrition was also maintained to evaluate the relative nutrient supply by the native soil. Three replications per treatment were maintained. Leaf damage by *A. catalaunalis* was recorded from 15 DAS onwards at weekly interval while flower and pod damage were recorded during the reproductive stage in five randomly selected plants in each accession per plot. The mean of observations thus recorded at various stages were computed. Seed yield per plant was also recorded at harvest. The data were subjected to analysis of variance under factorial randomized design after arcsine transformation of percentage values. Critical difference values were arrived at for comparing the mean values of each treatment.

RESULTS AND DISCUSSION

Among the accessions, plants of IVTS 2001-26 and among the nutrient sources, plants applied with azospirillium recorded the least damage by *A. catalaunalis* (Table 1). Flower damage was the least in farm yard manure applied plants (Table 2) while capsules of plants applied with either *Azospirillum* or farm yard manure were undamaged (Table 3). *Azospirillum* application would have conferred or at least increased the resistance of the plants as evidenced earlier by Amutha *et al*. (2003) who stated that co-inoculation of AM fungus, *Glomus* spp. with *Azospirillum brasilense* (Linn.) reduced the incidence of leaf folder, *Cnaphalocrocis medinalis* Guen. in upland paddy var. PKM-1. In contrast, plants supplied with inorganic fertilizers suffered more damage than plants without fertilizer application (control). In spite of higher insect infestation, inorganic fertilizers applied plants recorded higher seed yield in all the accessions but were on a par with AM fungi or phosphobacteria or *Azospirillum* applied plants. Variation in damage by *A. catalaunalis* was evident among the treatments and their interaction with the selected accessions. Though the accession, IVTS 2001-26 recorded the minimum leaf and flower damage, capsule damage was on par with the accession, IVTS 2001-20, which registered higher yield than others. It is concluded that bioinoculants increased the plant resistance while inorganic fertilizers evinced higher seed yield when compared to untreated plants. Further investigations on the biochemical influence of such nutrient sources may reveal the process of induction of insect resistance.

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Table 1. Influence of bio-inoculants and synthetic fertilizers on damage by *A. catalaunalis* in the selected sesame accessions

Accessions	Infested parts	Treatments					
		Farm Yard Manure	Azospirillium	Phosphobacteria	AM Fungi	NPK	Control
IVTS –2001-20	Leaf	24.77	21.29	27.14	28.68	31.05	33.72
	Flower	10.31	14.87	12.35	14.96	16.33	13.92
	Capsule	0.00	0.00	6.26	14.17	4.73	4.76
IVTS –2001-23	Leaf	27.67	21.45	29.52	21.50	33.98	37.21
	Flower	10.92	15.75	13.43	14.67	18.27	15.13
	Capsule	0.00	0.00	9.92	6.91	7.94	7.15
IVTS –2001-24	Leaf	19.25	14.71	22.41	24.11	26.45	31.04
	Flower	8.37	12.05	10.51	12.61	14.00	10.15
	Capsule	0.00	0.00	7.33	4.62	6.09	5.06
IVTS –2001-25	Leaf	19.94	15.18	22.24	24.81	27.08	29.44
	Flower	7.35	10.15	9.52	11.16	12.61	10.56
	Capsule	0.00	0.00	5.88	3.80	4.79	4.36
IVTS – 2001-26	Leaf	16.60	11.65	21.21	12.38	25.04	26.36
	Flower	4.83	6.91	6.26	8.04	9.07	7.66
	Capsule	0.00	0.00	4.01	2.43	3.67	3.48
IVTS – 2001-19	Leaf	28.25	23.85	30.46	35.07	37.97	42.26
(‘S’ check)	Flower	13.10	15.68	16.13	19.68	22.94	22.51
	Capsule	0.00	0.00	10.95	9.07	12.90	10.67

		Among Accessions	Among treatments	Accessions x Treatments
C. D. (p = 0.05)	Leaf	1.81	3.66	4.33
	Flower	1.33	2.73	3.00
	Capsule	0.81	1.73	2.83

Each Value is a mean of three replications @ five observations per replication Values are arcsine transformed

Table 2. Influence of bioinoculants and synthetic fertilizers on seed yield of selected sesame accessions

Treatments	IVTS – 2001-20	IVTS –2001-23	IVTS –2001-24	IVTS –2001-25	IVTS – 2001-26	IVTS – 2001-19 – 2001-19 ('S' check)
Farm yard manure	8.34	7.46	8.76	8.89	7.92	3.12
Azospirillum	10.28	8.57	9.23	9.84	8.72	5.06
Phosphobacteria	10.38	9.29	7.73	10.44	6.64	6.67
AM fungi	12.29	8.34	8.41	10.57	5.88	5.34
N:P:K	14.83	10.41	10.38	12.53	9.17	8.67
Control	5.68	4.05	5.22	4.52	4.96	2.95
C.D. (Among accessions)			1.52			
C.D. (Among treatments)			2.33			
C.D. (Accessions x Treatments)			3.40			

Values mean of three replications @ five observations per replication, Values are arcsine transformed

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