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Impact of polymer seed coating on major insect pests of soybean

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Abstract
Field experiment was conducted during *Kharif* 2017 at the farm of All India Coordinated Research Project on Soybean, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (Maharashtra) to study Impact of polymer seed coating on insect pests of soybean. Significantly less girdle beetle infestation of 6.00 and 10.16 per cent was recorded in treatment T1 i.e. JS 335 seed treated with carboxin and thiamethoxam with polymer coating as against of 10.50 and 16.83 per cent infestation in treatment T2 i.e. carboxin and thiamethoxam without polymer coating. Significantly less stem tunneling of 33.39 per cent was observed in T1 as compaired to T2 (41.01 per cent).
Treatment T1 showed significantly less defoliator population of 1.13 and 2.13 larvae/mrl at 30 and 45 DAG than treatment T2 which recorded 1.76 and 2.90 defoliators/mrl, respectively. Treatment T1 i.e. JS 335 with polymer coating showed significantly less whitefly population at 20 and 30 DAG (0.461/ leaflet and 1.4780/leaflet) than treatment T2 i.e. without polymer coating which recorded 0.867 and 1.571 whiteflies/leaflet, respectively. Comparatively very less population of whitefly might be the result of non-significant differences among the two treatments. Treatment T1 recorded 1424.60 kg/ha yield while treatment T2 recorded 1304.60 kg/ha yield and the differences were found non-significant.

Keywords: soybean, insect pests, impact, polymer coating

1. Introduction
Soybean, *Glycine max* (Linn.) Merrill belongs to order Fabales, family Leguminosae and subfamily Papilionoidae. Nagata (1960) [2] suggested that it has origin in China, in north central region. It contains about 40% protein, 20% oil having about 85% unsaturated fatty acid, 25-30% carbohydrates, 4-5 % minerals, That's why, it is known as a 'Wonder crop', 'Miracle crop' and 'Golden crop'.
The area, production and productivity of soybean in India during *Kharif* 2016-17 was 109.716 lakh ha, 95.00 lakh MT and 905 kg/ha, respectively. The area, production and productivity of soybean in Maharashtra during *Kharif* 2017-18 was 34.484 lakh ha, 29.003 lakh MT and 1102 kg/ha, respectively (Anonymous, 2017) [1].
In Maharashtra, especially in Marathwada 19 species of insects have been identified attacking this crop (Munde, 1982) [3]. Stem fly (*Melanagromyza sojae* Zehnter), girdle beetle (*Obereopsis brevis* Swedenborg), tobacco caterpillar (*Spodoptera litura*), semiloopers (*Gesonia gema, Achaya janata, Chrysodeixis acuta*.) and white fly (*Bemisia tabaci)* are important. The polymer coat provides protection from the stress imposed by accelerated ageing, fungal infection and pest infestation. It improves emergence of seedlings and plant stand in the field. Accurate application of chemicals reduces the wastage, polymer coat helps to make room for including all required ingredients, protectants, nutrients, plant growth promoters, hydrophobic / hydrophilic substances, oxygen suppliers etc. by encasing the seed within a thin film of biodegradable polymer. (Vanangamudi *et al.*, 2003) [5]. With this objective in this study an attempt was made to study the impact of polymer seed coating on major insect pests of soybean.

2. Material and Methods
The field experiment was conducted in paired plot design with two treatment and ten replications.T1- Soybean variety JS 335 seed treated with carboxin and thiamethoxam WITH polymer (L-200R) coating (Seed treatment of Rhizobium and PSB cultures done at the time of sowing).T2- Soybean variety JS 335 seed treated with carboxin and thiamethoxam WITHOUT polymer coating. (seed treatment with Rhizobium and PSB cultures were done at the time of sowing).

1. **Stemfly**
   a. **Seedling mortality –** Total number of plants and number of plants succumbed to stemfly infestation / mrl at 3 places per plot on 7 DAG were recorded. Mean of per cent seedling mortality was worked out.
   b. **Stem tunneling –** At physiological maturity, plant height and stem tunneled in 10 plants were measured and per cent stem tunneling was worked out.
2. **Whitefly:** Nos/leaflet (top, middle and bottom) in ten plants at random places per plot on 10, 20 and 30 DAG (days after germination) were recorded.
3. **Defoliators:** No. of larvae/mrl at 3 random places per plot on 30 and 45 DAG (days after germination) were recorded.
4. **Girdle beetle:** One meter rows marked at 3 places and number of total plants and girdled plants was recorded on 30, 45 and 60 DAG. From this, per cent plants infested were worked out.
5. **V. Yield:** In kg/plot and converted to kg/ha.

3. Results and Discussion

The data from table 1,2 and fig.1-4 revealed difference in pest infestation in treatment T1 i.e.JS 335 with polymer coating and treatment T2 i.e.JS 335 without polymer coating.

a. **Girdle beetle infestation:** At 30 DAG, the girdle beetle infestation was just started, hence non- significant differences were observed among polymer coated JS 335 seed (T1) and without coating seed (T2). However, at 45 DAG the girdle beetle infestation increased and recorded significantly less infestation of 6.00 % in polymer coated seed (T1) as against 10.16% in without polymer coated seed (T2).
b. **Stemfly:** No seedling mortality was observed at 10 DAG by the stemfly and at 30 DAG also, the differences in stem tunneling were found non-significant. However, at 45 DAG, treatment T1 i.e. JS 335 seed with polymer coating seed recorded significantly less stem tunneling of 33.39 % as against 41.01% in treatment T2 i.e. JS 335 seed without polymer coating. Siddiqui and Trimohan (2002) reported that infestation of stemfly reduced by thiamethoxam 70 WS.
c. **Defoliators:** Treatment T1 i.e. JS 335 seed treated with polymer coating showed significantly less defoliator population of 1.13 and 2.13 larvae/MRL at 30 and 45 DAG than the treatment T2 i.e.JS 335 seed without polymer coating which recorded 1.76 nd 2.90 defoliators/MRL.
d. **Whiteflies:** Treatment T1 i.e. JS 335 with polymer coating showed significantly less whitefly population at 20 DAG than the treatment T2 i.e. without polymer coating. However, the differences at 30 DAG were found non-significant. Siddiqui and Trimohan (2000) reported that whitefly population found less by thiamethoxam 70 WS.

Yield

Treatment T1 recorded 1424.60 kg/ha yield while treatment T2 recorded 1304.60 kg/ha yield and the differences were found non-significant.

Table 1: Impact of polymer coating on incidence of girdle beetle & stemfly

Tr No	Treatment details	% Girdle beetle infestation at 30 DAG	% Girdle beetle infestation at 45 DAG	% Girdle beetle infestation at 60 DAG	% Seedling mortality due to stemfly at 10 DAG	% Stem tunneling due to stemfly at 30 DAG	% Stem tunneling due to stemfly at 45 DAG
T1	JS 335 seed treated with Carboxin and Thiamethoxam With polymer coating (Seed treatment with Rhizobium and PSB cultures were done at the time of sowing)	4.334	6.000	10.500	0.00	26.63	33.39
T2	JS 335 seeds treated with Carboxin and Thiamethoxam Without polymer coating. (Seed treatment with Rhizobium and PSB cultures were done at the time of sowing)	6.500	10.166	16.833	0.00	33.72	41.01
	T test	NS	Significant	Significant	--	NS	Significant
	'T' Calculated	1.778	2.643*	2.422*	--	2.004	3.102*

*Significant at 5% **Significant at 1% T-Table (0.05)-2.262, T-Table (0.01)-3.25

Table 2: Impact of polymer coating on incidence of defoliators and whitefly and effect on yield

Tr No	Treatment details	Defoliators /MRL at 30 DAG	Defoliators /MRL at 45 DAG	No. of Whitefly/ Leaflet at 10 DAG	No. of Whitefly/ Leaflet at 20 DAG	No. of Whitefly/ Leaflet at 30 DAG	Yield (kg/ha)
T1	JS 335 seed treated with Carboxin and Thiamethoxam With polymer coating (Seed treatment with Rhizobium and PSB cultures were done at the time of sowing)	1.132	2.132	0.00	0.461	1.478	1424.60
T2	JS 335 seeds treated with Carboxin and Thiamethoxam Without polymer coating. (Seed treatment with Rhizobium and PSB cultures were done at the time of sowing)	1.766	2.900	0.00	0.867	1.571	1304.60
	T test	Significant	Significant	--	Significant	NS	NS
	'T' Calculated	2.889*	2.650*	--	9.788**	1.471	1.967

* Significant at 5% **Significant at 1% T-Table (0.05)-2.262, T-Table (0.01)-3.25

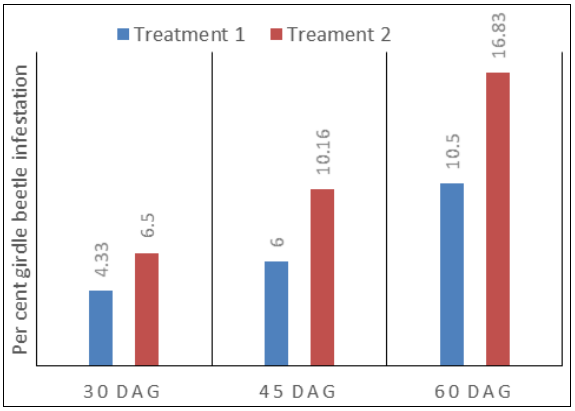

Fig 1: Effect of polymer coating on girdle beetle infestation

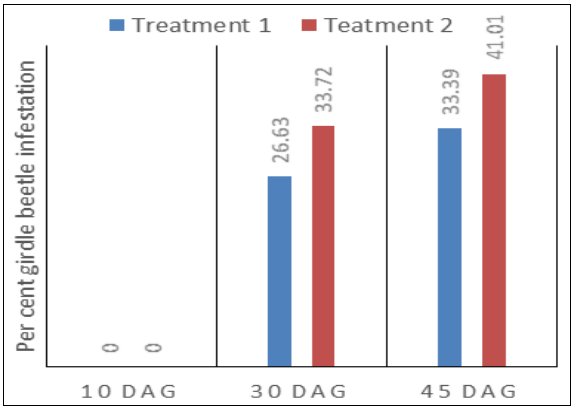

Fig 2: Effect of polymer coating on stemfly infestation

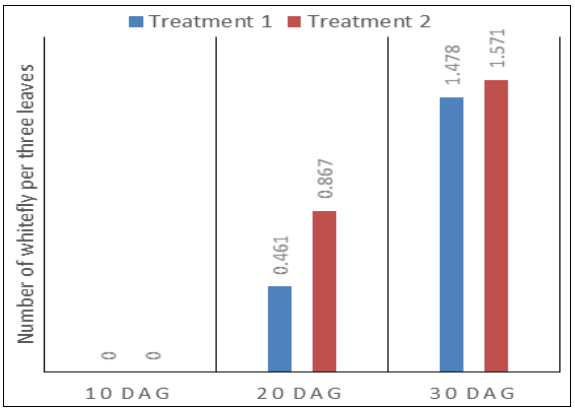

Fig 3: Effect of polymer coating on whitefly incidence

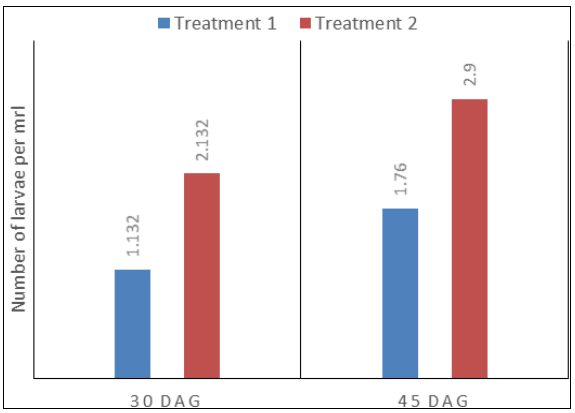

Fig 4: Effect of polymer coating on defoliator incidence

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