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EFFECTS OF POLYTHENE COVERING ON STEM GALL DISEASE AND YIELD OF CORIANDER (*CORIANDRUM SATIVUM* L.)

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Abstract

Coriander faces severe management issues from fungal diseases such as stem gall, wilt, blight and powdery mildew. A broad array of fungicides is used to control fungal diseases by the growers. These control agents are used injudiciously, Coriander is being of export commodity fungicides residue are very much conscious. Keeping this issues, experiment on solar heating of soil by polythene were conducted from 2014-15 to 2016-17 for the management of stem gall disease and yield of coriander. The minimum disease severity (4.6 to 21.3%) was recorded in Soil solarization + Plastic mulching+ seed treatment and foliar spray of 1% neem oil followed by Seed treatment with propiconazole (6.3-22.5%) , plastic mulching + seed treatment and foliar spray of neem oil (4.9-24.2%), Soil solarization + Plastic mulching (9.0-22.8%) and Soil solarization (5.3-23.3%). The highest seed yield of coriander was also recorded in Soil solarization + Plastic mulching+ seed treatment and foliar spray of neem oil (11.17q/ha).

Key words: soil solarization, plastic mulching, stem gall, yield, coriander

Introduction

Seed spices play a significant role in our national economy because of its large domestic consumption and growing demand for export. Presently 16.53 lakh ha of area is under seed spices cultivation with production of 11.75 lakh tonnes annually (Anon, 2016). Seed spices are mainly cultivated in Rajasthan and Gujarat and have sizeable area in Madhya Pradesh, Haryana, Punjab, Uttar Pradesh, Andhra Pradesh and Karnataka. 17 seed spices are grown in the country among them coriander is pillars of economic importance because it is the highest export earner next to cumin. Coriander production was 313.6 thousand tonnes from an area of 447.1 thousand ha with 701.4 kg/ha productivity during 2013-14 (Anandaraj, 2016). In spite of several technologies were developed for the boosting of coriander production *viz.* cultivation practices, high yielding varieties for different qualities and traits, management of pest and diseases, harvesting and post harvesting processing, quality of yield production is still less in comparison to other country, it is due to lack of stem gall resistance variety and climate change which enhanced biotic and abiotic stress. This would need high prioritized research to convert negative effect of increased temperature into positive opportunity. Therefore, present experiment was designed to harvest solar energy for management of stem gall disease through soil solarization and plastic mulching.

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Materials and method

The present research was carried out at Vegetable Form, N.D. University of Agriculture and Technology, Kumarganj, Faizabad, UP, India during *Rabi* 2014-15 to 2016-17. The seeds of coriander variety NDcar-2 were shown in field at 40cm × 10cm spacing with three replication and nine treatments *viz*. $\mathbf{T_1}$= Soil solarization by polythene sheet (60 days), $\mathbf{T_2}$= Plastic mulching (From sowing to harvest), $\mathbf{T_3}$= Seed treatment and three foliar spray at 45, 60 and 90 days with 1.0% neem oil, $\mathbf{T_4}$= Soil solarization by polythene sheet (60 days) + Plastic mulching (From sowing to harvest), $\mathbf{T_5}$= Soil solarization

by polythene covering (60 days) +Seed treatment and three foliar spray at 45, 60 and 90 days with 1.0% neem oil, $\mathbf{T_6}$= Plastic mulching (From sowing to harvest) + Seed treatment and three foliar spray at 45, 60 and 90 days with 1.0% neem oil, $\mathbf{T_7}$= Soil solarization by polythene covering (60 days) + Plastic mulching (From sowing to harvest) + Seed treatment and three foliar spray at 45, 60 and 90 days with 1.0% neem oil, $\mathbf{T_8}$ = Seed treatment with propiconazole @0.2%, $\mathbf{T_9}$= Control in randomized block design with plot size 2.4 M × 2.0 M. The field was prepared after harvesting of coriander and solarization were done for six week during May –June with covered transparent polythene sheets of thickness 100 inch and side were sealed. Plastic mulching was done in between line to line spacing from sowing to harvesting with transparent polythene sheets. Seed treatments were done with 1.0 percent neem oil and same concentration was used for foliar spray at 45, 60 and 90 days after sowing. Control was managed without any treatment. Observations were recorded *viz.* disease index, percent disease severity, seed yield and straw production. Disease indexing were done as 0-healthy, 1- gall on stem alone, 2- gall on stem and leaf, 3- gall on inflorescence, 4- gall on stem, leaf, inflorescence and seeds. Disease severity was observed with the number of plant falling each category of disease index and percent disease severity was calculated with following formula-

$$\%\, disease\, severity = \frac{Sum\, of\, all\, disease\, rating}{Total\, No.of\ plants \times Maxixum\, grade} \times 100$$

Results and discussion

Table (1) showed that the effect of treatments had significant impact on stem gall severity, disease index and yield of coriander at all growing years. The minimum disease severity was recorded in Soil solarization + Plastic mulching + seed treatment and foliar spray of 1% neem oil (ranging from 4.6 to 21.3%) followed by Seed treatment with propiconazole (6.3-22.5%), plastic mulching + seed treatment and foliar spray of neem oil (4.9-24.2%), Soil solarization + Plastic mulching (9.0-22.8%) and Soil solarization (5.3-23.3%), Whereas in control, it was 22.9-41.8 percent. Stem gall disease severity significantly decreased with increasing minimum and maximum temperature with soil moisture from December to February (Tripathi, 2003). The vegetative structure of *Protomyces macrosporus* remain resistant to desiccation and heat at 50^0C for 72hr and progressively lost the resistance with rise in temperature and fall in the period of exposure because survibility of chlamydospores were adversely affected by heat in the presence of moisture (Haware and Pavgi, 1971). Treatments have showed variable disease indexed plants. Healthy and gall appeared only stems (0, 1) were found in Soil solarization + Plastic mulching+ seed treatment and foliar spray of 1% neem oil, gall appeared on stem and leaves in Soil solarization, and Soil solarization + Plastic mulching. Duffe and Barnaart (1990) found suppression of disease through killing of soil borne inoculums of *Pythium myriotylum, Phytophthora nicotianae* and *sclerotium rolfsii* at 10 and 25 cm depths was achieved by solarization. The control of soil borne disease was enhanced by the integration of soil solarization with drenching of bavistin or dithane M-45. The change of microclimate through plastic mulching in the vicinity around the host plant significantly influenced both the host and pathogen because increasing temperature and moisture adversely affect the survivals of chlamydospores and blastospores of *P. macrosporus* and it also enhanced the vigorcity of plant growth. The maximum seed yield was recorded in Soil solarization + Plastic mulching + seed treatment and foliar spray of neem oil (11.17q/ha) followed by Soil solarization + Plastic mulching, Soil solarization, seed treatment with propiconazole and seed treatment and foliar spray with neem oil. The effects were found significant in all the treatments in comparison to control but not significant in between the treatments. The straw production was recorded highest in Soil solarization + seed treatment and foliar spray of neem oil in 2014-15 and 2015-16, whereas in 2016-17, the most effective treatment was soil solarization + Plastic mulching + Seed treatment and three foliar spray with neem oil. Plastic covering is an effective practice to restrict weed growth, conserve moisture and reduce the effect of soil borne diseases through soil solarization. The mulching is found beneficial in state like Rajasthan and UP as the proper solarization could be done due to high temperature prevailing in the area resulting higher yields as compared to non mulch field (Singh *et al.*, 2016). The integration of soil solarization and plastic mulching are a foolproof method to suppress weed growth, prevents leaching of fertilizers , act as physical barrier to rainfall and conserving the fertility of soil. Efficacy of foliar spray of neem oil was tested by Sudarshana *et al.*, (2012) against early

Table 1: Effect of solar heating of soil by polythene sheet on stem gall severity, disease index, seed yield and straw production of coriander.

Treatments	Stem gall severity (%)			Disease index			Seed yield (q/ha)			Straw yield (q/ha)		
	2014-15	2015-16	2016-17	2014-15	2015-16	2016-17	2014-15	2015-16	2016-17	2014-15	2015-16	2016-17
T_1= Soil solarization by polythene sheet (60days)	5.3	23.3	7.6	1	1 , 2	1 , 2	3.99	8.16	8.59	1.31	4.24	4.38
T_2= Plastic mulching (From sowing to harvest)	6.9	26.6	14.8	1,3	1,3	1,3,4	3.12	7.80	4.68	1.26	3.21	2.29
T_3= Seed treatment and three foliar spray at 45, 60 and 90 days with 1.0% neem oil	10.7	24.2	9.12	2,4	1,2,3	1,2,3	3.99	8.32	7.81	1.41	4.51	3.52
T_4= Soil solarization by polythene sheet (60days) + Plastic mulching (From sowing to harvest)	9.0	22.8	9.1	1,2	1,2	1,2	3.65	10.06	5.05	1.92	4.99	2.98
T_5= Soil solarization by polythene covering (60days) + Seed treatment and three foliar spray at45, 60 and 90 days with 1.0% neem oil	5.7	24.1	8.1	1,2	1,2,4	1,2,3	4.21	9.02	8.43	2.29	5.21	4.20
T_6= Plastic mulching (From sowing to harvest) + Seed treatment and three foliar spray at 45,60 and 90 days with 1.0% neem oil	4.9	24.2	8.2	1,3	1,3	1,3,	2.08	8.50	5.12	1.18	3.12	2.13
T_7= Soil solarization by polythene covering (60days) + Plastic mulching (From sowing to harvest) + Seed treatment and three foliar spray at 45,60 and 90 days with 1.0% neem oil	4.6	21.3	7.3	0,1	0,1	0,1	4.34	11.17	10.31	1.46	4.46	5.49
T_8 =Seed treatment with propiconazole @0.2%	6.3	22.5	8.0	3	1,4	1,3	3.47	8.68	9.37	1.33	4.33	4.35
T_9= Control	22.9	41.8	27.7	1,3,4	1,3,4	1,3,4	2.87	7.28	4.53	1.15	2.79	1.88
CD at 5%	3.72	5.50	6.13	-	-	-	0.927	3.70	3.48	0.441	0.821	0.741
CV	9.03	10.51	10.70	-	-	-	12.65	24.4	28.6	9.128	9.652	9.008

blight of tomato and resulted lowest incidence in neem oil as compared to other treatments.

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