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MANAGEMENT OF ASHWEEVIL MYLLOCERUS SUBFASCIATUS (ORD:COLEPTERA FAM:CURCULIONIDAE) ON BRINJAL SOLANUM MELONGENA L

Entomology

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ABSTRACT

Ash weevil *Myllocerus subfasciatus* (Guerin Meneville) is one of the serious pests that cause damage to the brinjal throughout the year. The severe infestation caused by an adult and grubs at a vegetative and later stage of the crop lead to more economic loss to the farmers to overcome the severity of pest damage. Different chemical and plant-based insecticidal treatments opted for soil application and foliar spray and use of effective Bio-agents (*Metrhizium anisoplea* and Entamophagous nematode EPN) viz., T1 neem cake @250 kg/ha applied before planting and repeated after 40 and 75 days after planting and need-based insecticides application as and when the pest reaches ETL level in the field. Pre-planting soil application of T3 vermicompost and *Metrhizium anisoplea* @ 7.5 kg/ha and T7 Entomopathogenic nematode (EPN) application @ 2.5 kg/ha before planting and Soil application of T6 carbofuran 3G @25Kg/ha and T5 fertera 12.5 kg/ha at 30th day of planting or whenever ash weevil adult noticed on the crop foliage. Spraying of T4 Fipronil 0.4 G and T2 Chlorpyriphos 20% EC Drenching with soil as and when visual notching of leaves noticed and movement of adult weevil noticed over the plant surface to manage ash weevil *M. subfasciatus* in brinjal. Among all these treatments T3 vermicompost and *Metrhizium anisoplea* @ 7.5 kg/ha applied thirty days before planting and repeated application at 35 days intervals recorded the lowest incidence and damage caused by the *Myllocerus subfasciatus* at 120 days after planting with significant increase in yield recorded followed by another T7 Entomopathogenic nematode (EPN) application @ 2.5 kg/ha before planting and at 25 days interval till the crop attain the age of 115-120 days.

KEYWORDS

Myllocerus subfasciatus, Ash weevil, Nematode, Entomophagous, fertera, fipronil, carbofuran, Neemcake, Chlorpyriphos

INTRODUCTION:

The eggplant or brinjal *Solanum melongena* belongs to the family Solanaceae and is grown worldwide for its edible fruits. Brinjal is one of the three important vegetable crops cultivated in the Southeast Asian region (Alam S.N. *et.al*.,2006). In India, Brinjal has been cultivated in an area of 6.69 lakh hectares and production of 12400 MT with an average productivity of 18.5t/ha during 2016-17 (Anon.,2017). In Karnataka brinjal is cultivated with an area of 7550 hectares with a production of 105513 tonnes during Kharif and 3651 hectares and a production of 42262 kg/ha during rabi (Anon.,2020). The crop is cultivated throughout the year as it provides regular income to the farmers. The subterranean grubs cause damage to the roots which results in wilting, drying, and death of the infested plants.The subterranean nature of grubs and pupae makes it difficult to manage grubs and adults in Brinjal. Farmers depend on soil and foliar insecticidal application to manage grubs and adults causing damage at seedlings and later stage of crops. Farmers spent 50 % of their cost of cultivation towards the management of brinjal shoot and fruit borer *Leucinodes orbonalis* and ash weevil *Myllocerus subfasciatus* Guerin-Meneville. The regular field surveys and interaction with the farmers imply that the ash weevil damage leads to 50-60% yield loss and sometimes complete loss of crop is also observed. They cause damage throughout the year. (Nagesh *et al*., 2016). The occurrence of *M. subfasciatus* during the fruiting stages leads to drastic yield reduction (Gowda and Veeresh, 1986). Though the farmers tend to use a combination of granular and liquid formulations for the management of *M. subfasciatus* the subterranean nature of the grubs. Hence the present investigation has been carried out with suitable plant protection measures for the effective management of ash weevil as and when noticed on the brinjal crop.

MATERIALS AND METHODS:

An experiment was conducted at ARS, Gangavati. Ankur hybrid brinjal(Abhishek 30 g) brinjal seeds used for rising nursery. Healthy seedlings from the nursery bed were selected for transplanting into the experiment plot. The experiment was laid out in RCBD design with 8 treatments arranged in 3 replications. The recommended dose of NPK is applied as per the package of practice. Treatment is imposed as and when pest infestation is noticed on the crop. Application of neem cake @250 kg/ha applied before planting and repeated after 40 days after planting (DAP) and 75 days after planting and need-based insecticides application as and when the pest reaches ETL level in the field. Pre-planting soil application of vermicompost and *Metrhizium anisoplea* @ 7.5 kg/ha applied 30 days before planting and repeated application at 35 days intervals till crop reaches the age of 120 DAP. Entomopathogenic nematode application @ 2.5 kg/ha before planting and at 25 days interval till the crop attain the age of 115- 120 days. Soil application of carbofuran 3G @10Kg/acre and fertera 12.5 kg/ha on the 30th day of planting or whenever ash weevil adult noticed on the crop foliage. Spraying of Fipronil 0.4 G and Chlorpyriphos 20% EC once a week as and when visual notching of leaves is noticed and movement of adult weevil noticed over the plant surface. Drenching the soil with chlorpyriphos @5ml/lit and granular insecticidal application after notching and withering of plant noticed in the experiment plot. The observations on the percentage of dead seedlings, adult population per plant, and grubs per plant were recorded at 30, 45, 65, 85, and 120 days after planting (DAP). The percentage of dead seedlings is calculated by using the formula.

$$\% \text{ Dead seedlings} = \frac{\text{No.of damged seedlings}}{\text{Total no.of seedlings}} \times 100$$

The characteristic leaf damage symptoms and plants showing withering symptoms were counted to study the *M. subfasciatus* damage. The damage symptoms were recorded at weekly intervals and repeated for up to 120 days. The completely withered plants were uprooted and observed for the presence of grubs to confirm the withering was due to *M. subfasciatus* incidence. The yield data in the different treatments were recorded during each harvest and pooled to calculate the per hectare yield. The percent incidence of *M.subfasciatus* in different treatments were statistically analyzed after performing the necessary transformation.

Treatment details:

Sl.no	Treatments	Dosage g/ml/acre/ha
T1	Neem cake	250 kg/ha
T2	Chlorpyriphos 20% EC	625ml/ha
T3	Vermicompost + Metrhizium anisoplea	7.5kg/ha
T4	Fipronil 0.4 G	12.5 Kg/ha
T5	Chlorantriniliprole 0.4G (Fertera)	12.5 kg/ha
T6	Carbofuran 3G	25 Kg/ha
T7	EPN (NBAIR)	2.5Kg/ha
T8	Control	--------

RESULTS AND DISCUSSION :

Percentage of dead seedlings:

the results of the present investigation were presented in Tables 1 and 2. The incidence of *M. subfasciatus* ranged between 27.98 to 76.65 percent of dead seedlings at 120 days after planting. As the crop period advances the percentage of dead seedlings caused by *M.subfasciatus* was more in the insecticidal application in the fields. The insecticidal composition, non-coincidence of insecticide application with pest occurrence, and survivability of early instars of pest in the soil are the major constraints for the higher incidence of *M.subfasciatus* in the field. These results were in agreement with Rahman *et al*., 2009 recorded the highest reduction of fruit and shoot borer incidence for the treatment combination of 4% neem oil and neem cake @250 kg/ha application at 15 days intervals.

The highest percent reduction of dead seedling percentage @76.65 percent was recorded by the T3: treatment combination with vermicompost and *Metrhizium anisoplea* @7.5 kg/ha and this particular treatment was found at par with T7: treatment soil drenching with Entomophagous nematode application (EPN) @ 5ml/lit recorded dead seedling percentage @ 75.95 percent reduction over control. On the other hand, the treatment T1: neem cake application to the soil before planting and repeated application at 40 and 75 days after planting recorded a dead seedling percentage @51.75 percent reduction over control at 120 DAP.

The insecticidal spray treatment viz., T4: fipronil @12.5kg/ha and T2: chlorpyriphos 20%EC @ 625ml/ha recorded dead seedling percentage of 50.91 and 42.66 percent reduction over control at 120 days after planting. However soil application of T5: fertera @12.5kg/ha at 30th days after planting recorded a dead seedling percentage @ 58.89 percent reduction over control at 120 days after planting. Whereas soil application of T6: carbofuran 3G @25 kg/ha recorded dead seedling percentage @ 27.98 lowest percent reduction over control at 120 DAP.

Adult population:

adult population of *M. subfasciatus* varied significantly among all eight treatments from 30 to 120 DAP. The highest adult population reduction over control @81.38 percent was recorded by the treatment T3: Vermicompost combination with *Metrhizium anisoplea* @7.5kg/ha and it was found on par with another treatment T7: Soil drenching with Entamophagous nematode EPN @5 ml/lit recorded ash weevil adult reduction @78.24 percent at 120 DAP results were in coincides with The treatment T1: soil application of Neemcake @250 kg/ha, T2: chlorpyriphos 20 %EC @625 ml/ha spray and T3: carbofuran 3G @25 kg/ha were found on par with each other by recording the Ash weevil adult population @38.06, 37.05 and 38.16 percent reduction over control at 120 DAP. Similarly, the insecticidal application of T4: fipronil 12.5 kg/ha and T6: fertera @12.5kg/ha recorded the lowest adult population of *M. subfasciatus* @31.14 and 28.65 percent reduction over control recorded at 120 DAP.

Grubs/plant:

significant difference in grubs populations per plant was recorded among the different treatments that include foliar spray and soil application of insecticides and bioagents at 30 to 120 days after planting (DAP). Considerable reduction in grubs population per plant recorded by two treatments T2: Vermicompost combination with *Metrhizium anisoplea* soil application @7.5kg/ha recorded highest reduction of grubs/plant @87.07 percent reduction over control followed by another Treatment T7: soil drenching with Entamophagous nematode (EPN) @ 5ml/litr recorded 77.96 percent reduction over control was recorded at the 120 DAP.

McGrew *et al*., 2010 found that the entomompathogen application time should coincide with the peak larval emergence period in their study on the management of annual bluegrass weevil *Listronotus maculicolis* (Coleoptera; Curculionidae).

On the other hand, foliar spraying of T2: chlorpyriphos 20 % EC recorded a remarkable decrease in the grubs population @ 62.94 percent reduction over control recorded at 120 DAP. The soil application of T1: Neemcake @250 kg/ha and foliar spray of T4: fipronil @12.5 kg/ha both are on par with each other by recording grubs population @50.13 percent reduction over control at 120 DAP. Lowest reduction of grubs @ 37.94 and 36.70 percent reduction over control recorded by the soil application of granular insecticidal treatments T5: fertera @12.5kg/ha and treatment T6: carbofuran 3G @25 kg/ha at 120 DAP. Nagesh *et al*., 2016 opined that EPN performed better in terms of more than 80% larval mortality was recorded in loamy, alluvial, laterite and black cotton soil.

Yield:

significant yield variation was recorded among all eight treatments. The treatment T2: Vermicompost combination with *Metrhizium anisoplea* soil application @7.5kg/ha recorded significantly highest yield @ 128.12 qt/ha followed by treatment T7: soil drenching with Entamophagous nematode (EPN) @ 5ml/litr recorded 124.95 qt/ha and it was found at par with T1 soil application of Neemcake @250 kg/ha recorded yield @121.02qt/ha.

On the other hand chemical insecticidal treatment of foliar spray and soil application treatment viz., T1: Neemcake @250 kg/ha, T4: fipronil @12.5 kg/ha, and soil application T6: carbofuran 3G @25 kg/ha were on par with each other by recording yield @ 121.02, 111.62 and 108.52 qt/ha and next followed by treatment T5: soil drenching with Fertera 0.4 G @ 12.5 kg/ha recorded yield @106.87qt/ha. Significantly lowest yield of 77.62 qt/ha was recorded by Untreated control.

Table 1: Mangement of Ashweevil Myllocerus subfasciatus on brinjal kharif 2021

Sl.no	Treatment details	Dosage g/ml/ha	30 DAP	45 DAP	65 DAP	85 DAP	120 DAP	% ROC	30 DAP	45 DAP	65 DAP	85 DAP	120 DAP	% ROC
			% of dead seedlings						Adult population/plant					
T1	Neem cake	250	2.79 (9.60)	2.89 (9.78)	3.02 (10.00)	3.10 (10.13)	3.45 (10.70)	51.75	8.33 (16.76)	7.04 (15.38)	6.31 (14.54)	6.24 (14.45)	6.12 (14.28)	38.06
T2	Chlorpyriphos 20%EC	625 ml	3.04 (10.02)	3.09 (10.10)	3.17 (10.26)	3.47 (10.73)	4.10 (11.54)	42.66	8.33 (16.47)	7.13 (15.48)	6.76 (15.07)	6.52 (14.78)	6.22 (14.41)	37.05
T3	V.Compost + metrhizium	7.5 kg	2.52 (9.08)	2.50 (9.10)	2.00 (8.13)	1.86 (7.82)	1.67 (7.41)	76.65	7.66 (16.05)	6.15 (14.34)	4.16 (11.75)	3.12 (10.16)	1.84 (7.72)	81.38
T4	Fipronil 0.4 G	12.5kg	3.03 (9.98)	3.10 (10.13)	3.16 (10.23)	3.28 (10.44)	3.51 (10.79)	50.91	8.00 (16.40)	7.30 (15.67)	7.20 (15.56)	7.05 (15.36)	6.78 (15.08)	31.14
T5	Fertera 0.4G	12.5kg	2.88 (9.71)	2.94 (9.86)	3.05 (10.06)	2.88 (9.76)	2.94 (9.86)	58.89	9.00 (17.44)	7.51 (15.89)	7.43 (15.81)	7.16 (15.50)	7.05 (15.35)	28.65
T6	Carbofuran 3G	10 kg	4.16 11.74)	4.22 (11.79)	4.35 (12.04)	4.91 (12.79)	5.15 (13.11)	27.98	8.00 (16.41)	7.61 (16.00)	6.85 (15.16)	6.24 (14.45)	6.11 (14.28)	38.16
T7	EPN (NBAIR)	5ml/ltr	3.01 (9.91)	2.75 (9.54)	2.21 (8.53)	1.94 (7.98)	1.72 (7.53)	75.95	6.36 (14.56)	4.80 (12.65)	4.94 (12.83)	3.05 (10.03)	2.15 (8.42)	78.24
T8	UTC	…..	5.51 (13.56)	5.92 (14.07)	6.95 (15.27	6.85) (15.16)	7.15 (15.50)	-----	8.33 (16.75)	8.46 (16.90)	9.19 (17.63)	9.64 (18.08)	9.88 (18.30)	----
Sem + CD CV			0.32 1.00 16.80	0.09 0.30 4.39	0.12 0.39 5.64	0.24 0.75 12.62	0.16 0.50 8.65	----	0.41 1.26 8.97	0.19 0.59 4.60	0.16 0.51 4.03	0.30 0.42 8.55	0.45 1.40 13.73	

Table 2: Mangement of Ashweevil Myllocerus subfasciatus on brinjal kharif 2020									Yield qt/ha
Sl.no	Treatment details	Dosage g/ml/ha	30 DAP	45 DAP	65 DAP	85 DAP	120 DAP	% ROC	
			Grubs population/plant						
T1	Neem cake	250kg/ha	6.00 (14.13)	5.20 (13.18)	4.75 (12.58)	4.24 1.86	4.05	50.13	121.02
T2	Chlorpyriphos 20%EC	625 ml	6.00(14.17)	4.59 (12.35)	3.60 (10.92)	3.15 10.19	3.01 (9.98)	62.94	114.37
T3	V.Compost + metrhizium	7.5 kg	3.00 (9.96)	2.50 (9.09)	2.19 (8.51)	1.62 7.30	1.05	87.07	128.12
T4	Fipronil 0.4 G	12.5kg	5.33 (13.31)	4.67 (12.48)	4.35 (12.03)	4.19 11.80	4.05	50.13	111.62
T5	Fertera 0.4G	12.5kg	6.00 (14.16)	5.52 (13.59)	5.41 (13.44)	4.49 12.22	5.04	37.94	106.87
T6	Carbofuran 3G	10 kg	5.33 (13.33)	5.40 (13.42)	5.98 (14.14)	5.34 13.32	5.14	36.70	108.52
T7	EPN (NBAIR)	5ml/ltr	4.33 (11.96)	2.10 (8.32)	1.94 (7.98)	1.86 7.82	1.79	77.96	124.95
T8	UTC	…..	6.33 (14.56)	6.56 (14.83)	7.06 (15.40)	7.98 16.39	8.12	----	77.62
Sem + CD CV			0.40 1.23 13.17	0.17 0.55 6.22	0.17 0.53 6.26	0.28 0.88 12.19	0.43 1.31 18.50	--------	8.05 24.17 12.36
Values in parenthesis are angular transformed values.									

CONCLUSION:

the different insecticidal and plant-based insecticidal treatments for soil application and foliar spray and use of Bioagents (*Metrhizium anisoplea* and EPN) viz., T1: neem cake @250 kg/ha applied 30 days before planting and repeated after 40 days after planting (DAP) and 75 days after planting and need-based insecticides application as and when the pest reaches ETL level in the field. Pre-planting soil application of T3: vermicompost and *Metrhizium anisoplea* @ 7.5 kg/ha applied 30 days before planting and repeated application at 35 days intervals till crop reaches the age of 120 DAP and T7: Entomopathogenic nematode (EPN) application @ 2.5 kg/ha before planting and at 25 days interval till the crop attain the age of 115- 120 days. Soil application of T6:carbofuran 3G @25Kg/ha and T5: fertera 12.5 kg/ha on the 30th day of planting or whenever ash weevil adult noticed on the crop foliage. Spraying of T4: Fipronil 0.4 G and T2: Chlorpyriphos 20% EC Drenching the soil as and when visual notching of leaves noticed and movement of adult weevil noticed over the plant surface to manage ash weevil *M. subfasciatus* in brinjal the treatment T3: vermicompost and *Metrhizium anisoplea* @ 7.5 kg/ha applied at thirty days before planting and repeated application at 35 days interval recorded lowest incidence and damage caused by the pest at 120 days after planting with a significant increase in yield recorded followed by another T7: Entomopathogenic nematode (EPN) application @ 2.5 kg/ha before planting and at 25 days interval till the crop attain the age of 115- 120 days. Hence farmers can use vermicompost combine with *Metrhizium anisoplea* @7.5kg/ha for the effective management of ash weevil in brinjal.

REFERENCES:

1. Alam. S.N., Hossain .M.I, Rouf. F.M.A, Jhala R.C, Patel. M.G, Nath. L.K, 2006. Control of egg
   a.Plant fruit and shoot borer in South Asia. *Technical Bulletin 36, AVRDC-The World*
   b.Vegetable Center, Shanhua, Taiwan
2. Anonymous., 2017. Horticultural Statistics at a Glance. Published by the Ministry of Agriculture
   a.and Farmers Welfare, *Department of Agriculture, Cooperation & Farmers Welfare,*
   b.Horticultural Statistical Division. 481
3. Anonymous.,2020. Fully revised estimates of Area, Production, and Yield of Principal crops in
   a.Karnataka. Published from *Directorate of Economics and Statistics Bengaluru*.
   b.No.DES/03/2020, Pp:163
4. Gowda K.S., Veeresh G.K., 1986 Assessment of crop loss in brinjal (Solanum melongena L.) due
   a.to Ashweevil M. subfasciatus Gurien. (Curculionidae; Coleoptera). *Journal of Soil*
   b.Biology and Ecology. 4(1):41-52.
5. McGraw B.A., Vittum PJ., Cowles R.S., Koppenhoer A.M., 2010 Field evaluation of entomopathogenic
   a.Nematodes for the biological control of the annual bluegrass weevil *Listronotus maculicolis*
   b.(Coleoptera; Curculionidae) in golf course turfgrass. *Biocontrol Science and Technology*.
   c.20(2):149-163.
6. Nagesh N, Krishnakumar NK, Shylesha AN, Srinivas N, Saleem Javeed. Thippisamy. 2016
   a.Comparative virulence of strains of entomopathogenic nematodes for the management
   b.of eggplant grey weevil Myllocerus subfasciatus Guerin (Coleopetra; Curculionidae).
   c.Indian Journal of Experimental Biology. 54:834-842.
7. Rahman M.M., Islam K.S, Jahan M, Uddin M.A., 2009 Efficacy of some botanicals in
   a.Controlling brinjal shoot and fruit borer *Leucinodes orbonalis*. *Progress. Agric*.
   b.20(1&2):35-42