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Evaluation of botanicals and synthetic insecticides against eucalyptus gall wasp, *Leptocybe invasa* (Eulophidae: Hymenoptera)

Eucalyptus spp basically a native of Australia and Tasmania, was introduced in India by the British in 1843 in Nilgiri Hills as an experiment to find high yielding species for fuel and timber. Today, Eucalyptus plantations occupy about 8 million ha of area. Eucalyptus are rather hardy species and affected only by a few insect pests. Recently, a severe attack by a new invasive gall insect, *Leptocybe invasa* Fisher & La Salle (Hymenoptera: Eulophidae) has been noticed in South India. In Karnataka also, it has been seen damaging and found in many nurseries of two major paper and rayon industries namely, West Coast Papers mills Ltd, Dandeli and Harihara Polyfibres, Harihara It has been seen damaging eucalyptus in and around Sirsi, Uttara Kannada district. *L. invasa* causes galls on the mid-ribs, petioles and stems of new shoots of eucalyptus trees. Heavy infestations can lead to deformed leaves and shoots resulting in reduced tree growth (Mendel *et al.,* 2004). Heavy infestations can damage an entire plantation if timely control measures are not adopted. All clones of Eucalyptus spp. are seriously damaged by *L. invasa* in many nurseries and young plantation and it is becoming increasingly difficult to find seedlings to establish new plantations. At this hour, the problem needs to be addressed on priority as it may lead to heavy economic loss to the farmers and other planting agencies. Hence the present study was undertaken to find out the efficacy of insecticides and botanicals at field level.

Field experiment was conducted during *Kharif* 2008 in two year old eucalyptus plantation at Sirsi to find out the efficacy of different treatments *viz.,* carbofuran 3G at two doses of 0.5g and 1.0 g per plant, Methyl parathion 50 EC (1ml/l), imidacloprid 17.8 SL (0.25ml/l), multineem, a commercial botanical pesticide at two doses of 2.5 ml and 5.0 ml per liter of water, another locally available botanical, soapnut (*Sapindus* spp.) as water extract at 5 per cent and combination of multineem and soapnut. Untreated check without any spray was also maintained in the experiment for comparison. The trial was laid out in a completely randomized block design with three replications. For each treatment a sample size of 20 plants were selected. All the treatments were imposed twice with an interval of 30 days. The 5 per cent aqueous extract of soapnut was prepared by soaking 50 g of crushed ripened fruits in 1 litre of water for 30 minutes. The solution was filtered through muslin cloth to get final spray solution. Carbofuran 3G, a granular insecticide was applied at the root zone as spot application whereas all other treatments

Table1: Field evaluation of insecticides and botanicals against eucalyptus gall wasp, *Leptocybe invasa (*Eulophidae: Hymenoptera).

Treatments	Dose	First spray				Second spray			
		Mean number of fresh galls at crown on 10 cm length twig							
		DBS	7 DAS	15 DAS	Mean	DBS	7 DAS	15 DAS	Mean
Carbofuran 3G	0.5g/pl	20.00	4.30	8.00	6.20	17.00	11.00	13.00	12.00
Carbofuran 3G	1.0g/pl	15.70	4.70	6.00	5.40	17.70	7.00	13.00	10.00
Methyl parathion 50EC	1ml/l	8.70	4.30	6.00	5.20	12.30	6.70	10.30	8.50
Imidacloprid 17.8 SL	0.25ml/l	12.70	4.00	4.70	4.40	5.70	4.30	7.70	6.00
Multineem (300 ppm)	2.5ml/l	8.00	16.00	17.70	16.90	21.70	19.30	25.70	22.50
Multineem (300 ppm)	5ml/l	21.70	16.70	15.00	15.90	26.30	13.70	23.00	18.40
Multineem(300 ppm) +soapnut extract 5%	2.5ml/l+50g/l	24.00	18.00	13.30	15.70	24.00	18.30	21.30	19.80
Multineem (300 ppm) +soapnut extract 5%	5ml/l+50g/l	22.30	16.30	12.80	14.60	17.70	11.70	24.00	17.90
Soapnut extract 5%	50g/l	18.30	15.70	20.00	17.90	26.70	17.30	16.70	17.00
Untreated Check (UTC)	-	20.30	19.70	17.90	18.70	28.00	21.00	26.30	23.70
	SEm ±	5.45	3.03	2.70	-	3.81	2.43	3.48	-
	CD	NS	8.99	8.03	-	11.31	7.22	10.35	-
	CV (%)	23.00	27.50	38.18	-	33.47	32.12	33.70	-

DBS=Day before spray
DAS=Day after spray

were given as foliar spray. Observations were made on five tagged plants for formation of fresh galls per 10 cm twig length at the crown region. Fresh galls were counted a day before spray (DBS), seven and fifteen days after spray (DAS). Data obtained were subjected to statistical analysis and presented in table-1.

The data on the average number of fresh galls ranged from 8.0 to 24.0 per 10 cm twig among all the treatments a day before first spray. However, all the treatments were on par with each other in having uniform pest load before spray (Table 1). At seven days after first spray (DAFS), the damage ranged from 4.0 to 19.7 galls per 10 cm twig. Spot application of carbofuran 3G at 0.5g/plant (4.3) and 1.0g/plant (4.7), foliar spray of methyl parathion 1ml/l (4.3) and imidacloprid 0.25ml/l (4.0) were on par with each other but superior to botanicals. Foliar application of botanicals were found ineffective in reducing the number of galls which ranged from 16.0 to 18.0 per 10 cm twig and did not differ significantly from untreated check. (19.7 gall/plant) during the period of observation. At 15 DAFS, foliar spray of imidacloprid @ 0.25ml/l exhibited maximum insecticidal action with 4.7 galls per 10 cm twig and statistically on par with carbofuran 3G 0.5g/plant (8.0) and 1.0g/plant (6.0), methyl parathion 1ml/l (6.0). Except, multineem @ 2.5 ml/l and soapnut extract @ 5%, other botanicals were found on par with synthetic insecticides. The mean data on number of fresh gall per 10 cm twig length indicated that synthetic insecticides excelled over botanicals. Among botanicals, multineem (5.0 ml/l) + soapnut extract (5%) was found best with 14.6 galls.

The number of fresh galls a day before second spray ranged from 5.7 to 28.0 per plant. All the insecticides were found statistically on par with each other whereas the treatments *Viz.,* multineem, multineem + soapnut extract and soapnut extract alone found significantly different from insecticides in recording the number of galls which ranged from 21.7 to 26.7 (Table1).The data on seven days after second spray (DASS) indicated that

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number of galls varied significantly between the treatments. Imidacloprid (0.25ml/l) was found most promising with 4.3 galls per 10 cm twig followed by methyl parathion 1ml/l (6.7), carbofuran 3G 1g/plant (7.0) and carbofuran3G 0.5g/plant (11.0) in the order of efficacy in reducing the number of galls caused by *L. invasa* and were statistically on par. Further, multineem (19.3 & 13.7), multineem + soapnut extract (18.3 & 11.7) and soapnut extract alone (17.3) were found to be inferior in reducing the galls and found on par with each other. At 15 DASS, the results revealed significant differences between the treatments. Botanicals were found ineffective in reducing the fresh gall formation and it ranged from 16.7 to 25.7 and on par with untreated check (26.3 galls). All synthetic insecticides proved excellent in managing the gall wasp damage. The mean observation showed that imidacloprid @ 0.25ml/l was found best with 6.0 galls followed by methyl parathion @ 1ml/l with 8.5 galls. The mean number of galls in botanicals varied from 17.9 to 22.5. The untreated check recorded 23.7 galls.

The findings of the present study indicated that all the insecticides were the best in reducing the fresh gall formation compared to botanicals. However, insecticides failed to reduce the number of galls to nil during the experimental period due to non efficacy of pesticides. This may be because of the less waiting period available for the insecticides to get translocated in the plant system due to frequent watering regime followed in the young plantation as opined by the committee constituted by IFG&TB, Coimbatore for appraising gall wasp problem in South India. This committee had a field visit cum meeting held on 17th April 2007 in Chennai and discussed the strategy to be adapted to prevent and contain the insect gall problem in eucalyptus (Anonymous, 2007).

This committee also suggested application of granular foliar insecticides coupled with root application of Chlorpyriphos 20 EC to contain the gall wasp in the nursery. The committee also concluded that application of foliar insecticides on foliage at fortnightly intervals be adopted to prevent insect gall problem in eucalyptus.

The present study revealed that all tested insecticides applied twice at 30 days interval were effective against the gall insect under field conditions. Hence these insecticides could be effectively used to manage the gall wasp in the eucalyptus nurseries.

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