J. Farm Sci., 30(2): (300-301) 2017

RESEARCH NOTE

Impact of integrated nutrient management in *Flemingia semialata* W.T. Aiton and yield of lac.

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(Received: September, 2016 ; Accepted:June, 2017)

The experiment was conducted during 2015-16 at Agricultural Research Station (ARS), Malagi, Mundgod taluka in Uttar Kannada district to investigate the effect of integrted nitrogen on number of infected shoots, length of infected shoots and lac yield, of *Flemingia semialata* W. T. Aiton was recorded. The experiment was conducted in randomized complete block design with ten treatments and three replications. Among the diffeent treatments, application of farm yard manure 2 kg/plant + NPK @ 175:100:50 kg/ha has recorded significantly maximum number of infected shoot (11.93), length of infected shoots (112.01 cm) and Lac yield (2273.33 kg/ha) compare to other treatments. This was followed by FYM 2 kg /plant + NPK@ 150:100:50 Kg/ ha The results were attributed due to the application of optimum levels of organic manure and varied nitrogen levels.

Key words: Forest, Lac, Yield

Flemingia semialata is one of the most suitable lac host plant which is bushy in nature and quick growing, and more importantly lac cultivation can be started from second year on commercial basis. The practice of lac cultivation on Flemingia semialata has been standardized (Jaiswal and Singh 2012) and it has shown potential for intensive lac cultivation in short time and provides very attractive returns. *Flemingia semialata* can also be integrated in agriculture, horticulture and forest systems for enhanced income (Singhal *et al.,* 2014). Lac, a natural resin produced by the tiny lac insect *Kerria lacca* Kerr. (Homoptera: Tachardiidae), is considered an important income-generating produts for rural people in India, particularly for the tribal communities residing in and adjacent to forest areas. India is the largest producer of lac in the world. (Yogi *et al.,* 2016). In India the lac insect is usually found in forests of Himalayan terai, hilly regions of Jharkhand, West Bengal, Odisha, Madhya Pradesh, Uttar Pradesh, Rajasthan, Gujarat and Assam. "Nitrozen fertilization" showed the succulent stem which is most suitable for lac insect to produce more lac. Yet, we have limited success in predicting both the effects of fertilization on plant tissue quality and quantity for herbivores, and the impact of herbivore on plant growth. The primary objective of this study was to evaluate the effects of N fertilization on plant-insect interactions by determining the plant processes that are affected by N, and in turn, regulate herbivore responses. An increase in nitrogen dosage will correspondingly increase the nitrogen level in the plant. A higher amount of nitrogen in the plant will make the plant more susceptible to insect attack.

The present study was conducted at the Agriculture Research Station (ARS), Malagi, Mundgod Taluka in Uttara Kannada district, Karnataka. The experimental site is situated at 14°59°N latitude and 75°16°E longitude. One year old Flemingia plantation with a spacing of 1x1 m established during 2014 was selected and treatments were imposed. The average annual rainfall was 2210 mm and total rainfall received during study period(2015) was 1500.8 mm .The experiment was laid out in randomized complete block design with ten treatments and three replications. Treatments consisted of T_1 : FYM (2 kg/plant), T_2 : FYM (2 kg/plant), +Mycorrhizae (20 g/plant), T_3: FYM (2 kg/plant), + Phospurus Solubulizing Bacteria+ Mycorrhizae (20 g +20 g/plant), T_4 : FYM (2 kg/plant) + 50:100:50 NPK kg/ha, T_5 : FYM (2 kg/plant) + 100:100:50 NPK kg/ha, T_6 : FYM (2 kg/plant) + 125:100:50 NPK kg/ha, T_7 :FYM (2 kg/plant) + 150:100:50 NPK kg/ha, T_8 : FYM (2 kg/plant) + 175:100:50 NPK kg/ha, T_9 : FYM (2 kg/plant)+PSB + Mycorrhizae+ 50:100:50 NPK kg/ha, & T_{10} is Control. Manures were applied during *Kharif* 2015 and fertilizers were applied in two equal split dozes in July and December 2015.The observations recorded of *Flemingia Semialata* are number of infected shoots, length of infected shoots at monthly interval and lac yield was recorded at harvest. There were thirty plants for each treatments. The collected data from the experiment was analyzed statistically using MSTAT-C programme by adopting randomized complete block design. The level of significance used in 'F' and 't' test was P=0.05.

The present study revealed that application of inorganic, organic, bio-fertilizer and their combinations showed significant difference in number of infected shoots, length of infected shoots, and lac yield. The results indicate that the mean larval settlement after broodlac inoculation was more in the nitrogen fertilized plots compared to the control. Among the different treatments application of FYM (2 kg) + 175:100:50, NPK kg/ha showed significantly higher number of infected shoots ie 4.23, 7.32, 9.77, 11.01, and 11.93 (Table 1) and length of shoot infected 21.05 cm, 44.07 cm, 67.82 cm, 90.70 cm, and 112.01 cm (Table 2) at one Month After Treatment imposition(MAT), 2 MAT, 3 MAT, 4 MAT and 5 months after treatment respectively. This was followed by FYM 2 kg + 150:100:50 NPK kg/ha. The number of infected shoots and length of infected shoots were more in the treatments received higher nitrogen levels which in turn increases the succulence and made the plant more susceptible to insect attack. NPK increase the succulence and more availability of phloem sap which increases the attack of lac insects in ber (Shah. *et al.* (2014). The results are in conformity with the findings of Ahmed *et al.* (2007) reported that application of different doses of N fertilizer (50, 100,150 and 200 kg/ha) on sucking pest complex of cotton (Cv. CIM-473) and observed maximum number of sucking pests in higher dozes of nitrogen especially jassid, whitefly and thrips as compared to lower dozes. Dardeau *et al.* (2015) in poplar fertilization on amino acid mobilization by a plant-manipulating insect and reported that fertilization enhanced poplar growth and increased the free amino acid content of bark tissues. Infestation also triggered accumulations of both free

Table 1. Effect of integrated nutrient management on number of shoots infected and lac yield in *Flemingia semialata* at different stages

Treatments	1 MAT	2 MAT	3 MAT	4 MAT	5 MAT	Lac yield (kg /ha)
T_1 FYM (2 kg)/plant)	1.47	2.93	4.90	5.23	5.31	1203.33
T_2 T1+Mycorrhizae (20 g/plant)	1.73	3.60	5.62	5.92	6.17	1330.00
T_3 T1+ PSB+ Mycorrhizae (20 g +20 g/plant)	1.96	4.31	6.47	6.87	7.23	1426.67
T_4 T1+ 50:100:50 NPK kg/ha	2.28	4.72	6.81	7.56	8.04	1546.67
T_5 T1+ 100:100:50 NPK kg/ha	3.19	5.47	7.63	8.42	8.92	1703.33
T_6 T1+ 125:100:50 NPK kg/ha	3.53	5.92	7.80	8.93	9.71	1893.33
T_7 T1+ 150:100:50 NPK kg/ha	3.87	6.57	9.03	9.90	10.97	2106.67
T_8 T1+ 175:100:50 NPK kg/ha	4.23	7.32	9.77	11.01	11.93	2273.33
T_9 T1+PSB+ Mycorrhizae+ 50:100:50 NPK kg/ha	2.52	4.97	7.16	7.97	8.53	1633.33
T_{10} Control (without application of manures and fertilizers)	1.38	2.68	4.43	4.76	5.07	1146.67
S.Em±	0.05	0.11	0.17	0.11	0.12	46.78
C.D. @5%	0.17	0.34	0.50	0.33	0.38	140.08

MAT: Months after treatments imposition

Table 2. Effect of integrated nutrient management on length of shoots infected (cm) and lac yield(kg/ha) in *Flemingia semialata* at different stages of plant growth.

Treatments	1 MAT	2 MAT	3 MAT	4 MAT	5 MAT	Lac yield (kg /ha)
T_1 FYM (2 kg)/plant)	9.97	21.02	33.10	45.20	1203.33	60.57
T_2 T1+Mycorrhizae (20 g/plant)	12.03	24.81	39.21	54.23	1330.00	64.02
T_3 T1+ PSB+ Mycorrhizae (20 g +20 g/plant)	14.01	29.22	44.17	62.10	1426.67	71.10
T_4 T1+ 50:100:50 NPK kg/ha	15.03	31.57	47.43	66.03	1546.67	79.47
T_5 T1+ 100:100:50 NPK kg/ha	17.07	35.26	54.20	74.37	1703.33	86.81
T_6 T1+ 125:100:50 NPK kg/ha	18.73	39.60	60.01	82.04	1893.33	95.30
T_7 T1+ 150:100:50 NPK kg/ha	20.17	42.03	63.37	85.80	2106.67	104.90
T_8 T1+ 175:100:50 NPK kg/ha	21.05	44.07	67.82	90.70	2273.33	112.01
T_9 T1+PSB+ Mycorrhizae+ 50:100:50 NPK kg/ha	16.04	32.75	51.41	70.13	1633.33	82.52
T_{10} Control (without application of manures and fertilizers)	9.20	19.06	30.43	42.18	1146.67	55.67
S.Em±	0.08	1.03	1.34	1.25	46.78	0.95
C.D. @ 5%	0.26	3.10	4.01	3.75	140.08	2.86

MAT: Months after treatments imposition

and protein-bound amino acids in the feeding sites. Paine and Hanlon (2010) demonstrated that low water applications and high levels of fertilization resulted in higher levels of red gum lerp psyllid. The data pertaining to lac yield (kg/ha) after completion of the experiment (5 MAT) as influenced by organic manure, inorganic fertilizers and biofertilizers and their combinations in *Flemingia* plantation are given in Table 2. Among all the treatments application of FYM (2 kg) + 175:100:50, NPK kg/ha showed maximum lac yield (2273.33 kg/ha) and minimum was recorded (1146.67 kg/ha) in control (T_{10}) These results are in line with studies conducted by Shah *et al.* (2014) in *Zizyphus mauritiana* (Lamb.) on the survivability of lac insect and the yield of Aghani crop of Kusmi lac in ber plant. It was concluded that increased levels of nitrogen resulted in higher plant succulence, more number of infected shoots and finally higher lac yield.

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