ISSN: 0974 - 0376

The Ecoscan : Special issue, Vol. VIII: 355-359: 2015
AN INTERNATIONAL QUARTERLY JOURNAL OF ENVIRONMENTAL SCIENCES
www.theecoscan.in

PERFORMANCE OF *KERRIA LACCA* (KERR) IN RESPONSE TO FOLIAR APPLICATION OF NUTRIENTS ON *BUTEA MONOSPERMA*

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KEYWORDS

Boron
Zinc
Humic acid
K. lacca
B. monosperma

Proceedings of National Conference on Harmony with Nature in Context of Bioresources and Environmental Health
(HORMONY - 2015)
November 23 - 25, 2015, Aurangabad,
organized by
Department of Zoology,
Dr. Babasaheb Ambedkar Marathwada University
Aurangabad (Maharashtra) 431 004
in association with
National Environmentalists Association, India
www.neaindia.org

The Ecoscan
AN INTERNATIONAL QUARTERLY JOURNAL OF ENVIRONMENTAL SCIENCES

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ABSTRACT

A field trial was conducted on lac grower's field in village Dungariya, Barghat Block, Seoni District, Madhya Pradesh during the year 2014-15 in RBD with four replications. The trial was consisted six treatments *viz.,* Zinc (T_1), Boron (T_2), Humic acid (T_3), Zinc + Humic acid (T_4), Boron + Humic acid (T_5) along with Control i.e. Water spray (T_6) had three foliar applications at 30, 45 and 60 days after Broodlac inoculation (BLI). Foliar application of nutrient had a significant in the mean lac yield per plant over the control. The increase was highest over control in T_1 (262.06%) followed by T_4 (186.2%), T_2 (163.7%), T_5 (153.4%) and T_3 (150%). The mean dry weight of 100 cells of lac insect was highest in T_1 (3.68g) followed by T_2 (3.49g) T_5 (3.43g), T_4 (3.41g), T_6 (3.21g) and T_3 (3.03g). There was a significantly increase the dry weight of 100 lac cell of *Rangeeni lac,* It was highest over control in T_1 (14.64%) followed by T_2 (8.77%).

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INTRODUCTION

Lac insect, *Kerria lacca* (Kerr) is a phloem feeder; possesses piercing-sucking type of mouth parts and draws sap form plant. In this process the insect secrets resinous substance from its three pair of highly specialized lac glands (Colton, 1984.) Lac is a minor forest produce, serves as a cash crop for forest dependents and tribal community in in Madhya Pradesh (Ogle and Thomas, 2006). Lac production is a profitable option for farmers in Jharkhand, Chhattisgarh, Madhya Pradesh, Orissa and West Bengal (Ghosal, 2013).

Growth of the host plants is a deciding factor for the insect's dependant on them. Micro-nutrients play a vital role in the growth of the plants, especially Zinc and Boron. Zn is required in synthesis of the growth hormone Indole acetic acid it also accelerates protein synthesis (Marschner, 1986) and encourages phospholization as well as green plastids enzymes. In the phloem sap Zn makes up complex with organic acids with low molecular weight, and increases its concentration (Kochian, 1991). Zn is an essential micro-nutrient for higher plants; it has an important role in sugar transport, cell wall synthesis and structure, lignifications, metabolism of carbohydrate, Indole acetic acid, phenol RNA metabolism, respiration, and membrane transport (Parr and Loughman, 1983). Plant requires B for synthesis of amino acids, proteins and regulation of carbohydrate metabolism. B application has been reported to increase the yield and growth of cotton crop (Malik *et al.,* 1992) and its deficiency hampers plant growth by reduced photosynthate translocation through vascular bundles of petioles, causing stunted growth and abnormal reproductive development (Blevins and Lukaszewski, 1998).

The *K. lacca* being a phloem feeder its growth and development depend on the growth of its host plants and nutrient supplied by it. A highly nutrition plant sap is expected to promote better growth of *K. lacca* and that for more lac production.

It is widely acknowledged that nutrients play an important role in the plant growth (Dianda et al. 2009), Though, Baidoo and Mochiah (2011) indicated that increase nutrient application enhances plant growth; but it can make the plant more attractive to pests or better growth of plants which supported their survival and reproduction. Nutrient management of the host tree of lac insect is likely, to increase the growth of the host tree and lac productivity. The effect of soil application of nutrients in *Z. mauritiana* and reported lac yield increased by 18.53 to 39.16% in nutrients managed *Z. mauritiana* over the control (Namdev, 2015). There is a need to validate these agreements, as any positive results will not only conserve the host there, but also economically benefit the lac growers. Keeping this in view, study was under taken on the effect of nutrients on *Butea monosperma* (Lam.) Taub. on the performance of *Kerria lacca* (Kerr).

MATERIALS AND METHODS

The present field research was carried out at Dungariya village, Barghat Block, Seoni District, Madhya Pradesh from July 2014 to October 2014.The study was planned under RBD, with four replications and six treatments *viz.,* Zinc (T_1), Boron

(T_2), Humic acid (T_3), Zinc + Humic acid (T_4), Boron + Humic acid (T_5) and Control i.e. Water spray (T_6). The spray solutions of both insecticide as well as micro-nutrients was prepared by adding its desired quantity (@1g of Cartap hydrochloride/litre of water, in case of Zinc @ 1g/litre of water, Boron @ 2g/litre of water, Humic acid @ 30ml/litre) in a small container followed by brisk stirring with a piece of stick. This concentrate solution were further diluted with clear water to make the spray solution. All the treatments were sprayed with Cartap hydrochloride to minimize the incidence of predators and parasites of *K. lacca*. Spray of all the treatments were 15 days interval after 30days of Broodlac inoculation except the control.

Lac host (*Butea monosperma*) with succulent branches were selected for Broodlac inoculation (BLI) and trunk of the trees was numbered with oil paint. Healthy Broodlac varying from 200g to 400g were used per *B. monosperma* tree on (depending on the number of succulent branches of the tree). Broodlac were inoculated on 14-15 July 2014. The Broodlac bundles were shifted carefully to different branches on the same tree after 7- 8 days of Broodlac inoculation where *Phunki* was removed after 21 days of Broodlac inoculation. After 30 days of BLI, first spray was done; second and third spray was done at 45 days and 60 days after BLI.

Shifting of Broodlac inoculated on the host tree from lac larvae settled branches to less settled or new branches of the same *B. monosperma* was done on 7th days after BLI i.e. on 23rd July 2014, This was to ensure uniform distribution of the brood on all the branches of *B. monosperma* where there was no or insufficient lac larval settlement.

The mean dry weight (g) of 100 cells of lac insect and the mean weight of sticklac (g) per 30 cm were recorded among different treatments. Mean raw lac yield (kg) recorded among different treatments.

RESULTS AND DISCUSSION

The lac crop was harvested on 08th November 2014. The mean weight of 30 cm sticklac varied from 46.25 to 63.50 (g) among the different treatments which was significantly different (Table.2). The mean weight (g) of sticklac per 30 cm was highest in Zn (63.50g) followed by B (57.56g), T_3 (52.94) HA (50.38g), T_5 (49.94g) and T_6 (46.25g). The increase in the mean weight of sticklac over the control was highest with (27.16%) Zn followed by B (19.64%), (12.63%) HA, (8.19%) Zn + HA and (7.38%) B + HA. Zn application increases plant growth through production of IAA and metabolism Mallick and Muthukrishnan (1979) thus there is likely that the Zn treatment may have significance in increasing the weight of sticklac.

A better nourished plant bear heavier branches and the sap feeders on it gets better quantity and quality food. In order get clear picture of true fact, the stick lac was scrapped after harvest to record weight of dry lac and sticklac. There was significance difference in the mean weight of both dry lac and sticklac among the treatments. It's the mean weight of raw lac per plant has highest T_1 (2.10kg), followed by (1.53kg), (1.45kg), (1.66kg), (1.47kg) and (0.58 kg) among the Treatments, T_2, T_3, T_4, T_5 and

Table 1: Foliar spray schedule of Zinc, Boron and Humic acid on *B monosperma* tree

S. no.	Treatment (Application of)	Dose/litre	Spray schedule 1st spray	2nd spray	3rd spray
T_1	Zinc	1g	15th Aug. 2014	1st Sept. 2014	16th Oct.2014
T_2	Boron	2g			
T_3	Humic acid	30ml			
T_4	Zinc + Humic acid	1g + 30ml			
T_5	Boron + Humic acid	2g + 30ml			
T_6	Control i.e.(water spray)	4 liter/plant			

Table 2: Mean weight of sticklac (g) per 30 cm

Replications	Mean weight of sticklac per 30cm among different treatments					
	T_1	T_2	T_3	T_4	T_5	T_6
R_1	69.25	55.75	60.75	53.75	50.00	49.5
R_2	59.25	59.50	54.50	60.25	53.50	54.25
R_3	58.25	54.75	48.50	46.25	47.00	43
R_4	67.25	60.25	48.00	41.25	49.25	38.25
Mean	63.50	57.56	52.94	50.38	49.94	46.25

SEm ± 2.39 CD 5% 7.21

Table 3: Mean dry weight (g) of 100 cells of lac insect

Replication	Mean dry weight (g) of 100 cells in different treatments					
	T_1	T_2	T_3	T_4	T_5	T_6
R_1	3.52	3.50	3.22	3.51	3.08	2.75
R_2	3.49	3.75	3.11	3.13	3.54	3.62
R_3	3.77	3.49	2.93	3.56	3.50	3.42
R_4	3.95	3.20	2.87	3.44	3.61	3.03
Mean	3.68	3.49	3.03	3.41	3.43	3.21

SEm ± 0.13 CD 5% 0.38

Table 4: Mean dry weight of scrap lac /30 cm of sticklac at after harvesting of lac

Replications	Mean dry weight of scrap lac /foot of sticklac in different treatments					
	T_1	T_2	T_3	T_4	T_5	T_6
R_1	13.45	9.91	11.79	13.01	10.00	7.29
R_2	11.64	11.72	13.97	10.73	13.84	12.58
R_3	13.71	8.37	11.07	10.77	10.77	8.92
R_4	16.92	8.01	8.95	12.14	12.14	8.08
Mean	13.93	9.50	11.44	11.66	11.84	9.22

SEm ± 0.98 CD 5% 2.96

Table 5: Mean raw lac yield (kg) per plant

Replications	Mean raw lac yield (kg) per plant among different treatments					
	T_1	T_2	T_3	T_4	T_5	T_6
R_1	1.87	1.45	1.67	1.76	1.11	0.46
R_2	2.07	1.84	1.95	1.93	1.88	0.70
R_3	1.88	1.17	1.25	2.00	0.85	0.66
R_4	2.58	1.68	0.91	0.94	2.04	0.48
Mean	2.10	1.53	1.45	1.66	1.47	0.58

SEm ± 0.20 CD 5% 0.60

T_6 respectively. Treatment (Zn) was 72.38% obtain more over the control. In present study the yield of raw lac on *B. monosperma* with nutrients treatment significantly increased over the control. It may be attributed to the nutrient management of host plant.

Each *K. lacca* insect secrets lac over its body from a protective lac cell. The quantity of lac secreted depends on the nourishment it draws from the host plant. Thus the weight of individual lac cells in an indication of lac resin the insect produced. The mean dry weight of 100 cells of varied from 3.68g to 3.03g among the treatments and there was significant. There was 12.70 Per cent more weight of 100 dry lac cell in the treatment Zn over the control. Zn is essential plant mineral nutrients that act as a co-factor of 300 enzymes/proteins, which take part in nucleic acid metabolism, cell division and protein synthesis (Marschner, 1986). Thus Zn stimulates the growth of plant tissues (Mallick and Muthukrishnan, 1979) as it is very closely involved in the nitrogen metabolism of plants. In plants with Zn deficiencies, protein synthesis and protein levels are drastically reduced whereas amino acids accumulate. These may be the possible reasons for an increase in the 100 cell weight in case Zn treatment. Further the mean 100 cell weight of *Rangeeni lac* varied from 3.03 to 3.68g which was higher than that (2.63g) reported by Patel (2013).

The result indicated that on three foliar application of Zn on *Butea monosperma* inoculated with Rangeeni strain of *k. Lacca*, the insect secretes 33.81 per cent more resin over the control.

The *B. monosperma* plants on the experimental site were comparatively smaller as they were about 6 year conserved plants in the Forest Beat Dungariya. The mean dry weight of scrap lac per 30cm of sticklac varied from 9.22g - 13.93g significantly highest lac yield was obtained in the treatment T_1 (13.93g) followed by T_5 (11.84g),T_4 (11.66g), T_3 (11.44g),T_2 (9.50g) and T6 (9.22g). The increase in per cent of lac yield over the control was 33.81 per cent in T_1 treatment.

Shifting process was evolved for efficient use broodlac and for the first time it was carried out by Khobragade (2012). Since then shifting has become popular and the operation followed by many workers (Bhalerao, 2013; Janghel, 2013; Patel, 2013).

The net profit was highest (Rs 394.4 per tree) in case of Zn followed by (Rs 274.65 per tree) B, (Rs 251.1 per tree) HA, (Rs 212.85 per tree) Zn + HA, (Rs 207.75 per tree) B + HA and it was lowest (Rs 76.96 per tree) in case of Control. The Cost-Benefit ratio was highest (1:4.99) in Zn followed by (1:3.94) B, (1:2.05) Zn + HA, (1:1.87) HA, (1:1.69) B + HA and it was lowest (1:1.45) in case of Control. Where is the C:B ratio reference of other workers is1:3.83 to 1:7.85 (Patel, 2013), 1:6.07 to 1:6.93 (Namdev, 2014) on *Zizyphus mauritiana* 1:4.76 to 1:6.05 (Janghel, 2013) on *B. monosperma*.

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