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INFLUENCE OF NUTRIENTS ON GROWTH OF *RAUVOLFIA SERPENTINA* (L.)

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ABSTRACT:
The experiment was conducted on *Rauvolfia serpentina* (L.) at Botany department, RTM Nagpur University, Nagpur (M.S.). RBD with three replications and from each replication ten seedlings were selected for the study. The physiochemical parameters of potting media were analyzed for the growth of seedlings. Soil analysis i.e. pH 7.2, moisture content 0.12, EC 0.03 dSm-1, N 75, P 33.60, K 249.3, Ca 29.50, Mg 10, Fe 22, Mn 34, Zn 10.2, Cu 9.16 Kg/ha were analyzed for nutritional status of soil. Individual elements were applied to experimental plants after 12 days interval in stepwise manner enabling to study its influence on growth and development of plants till that becomes 108 days old. Treatment F2P5 (Compost mixture) was the highest interaction effect on dry root yield (914 kg/ha) & its yield attributing character i.e. plant height (59 cm)), no. of leaves (54.67) & no. of branches (25.33) at nutrient combination level (70: 50:25: 60:42: 17: 40: 14: 12 kg/ha N, P, K, Ca, Mg, Fe, Mn, Zn, Cu) than control. The results of the field experiment indicated after the nutrients application combination of F2P5 treatment, comparatively higher dry root yield, maximum plant height, and maximum no. of leaves as compared to (F1P5) and control. Therefore interaction effect of (F2P5) treatment was found significantly superior over control & rest of the higher & lower treatments of macro & micronutrients. Statistical analysis was done by preparing the table of means with appropriate standard error (S.E.) and critical difference (C. D.) at 5%. The 'F' test was recorded to be significant.

Keywords: - Rauvolfia serpentina, Application of macro and micronutrients, root yield and yield attributing characters , Statistical analysis.

INTRODUCTION :

Rauvolfia serpentina commonly known as chota chand, the family Apocyanaceae, does a short inhabiting the hot and humid regions of South and South East Asian countries, mainly India, Ceylon, Burma and Indonesia. It requires slightly acidic to neutral soils for good growth. However, its commercial cultivation is found possible in soils with 6 to 8.5 pH, medium to deep well drained fertile soils. Clay-loam to silt-loam soils, with high in organic content is suitable for its commercial cultivation. In deccan plateau, it does extremely well under cultivation over medium to shallow black cotton soil of Malwa and near tracts of western Madhya Pradesh (Maheshwari et al., 1984). Wakhloo (1962) studied effect of temperature, soil mixture, period of storage of seed and behaviours of seed germination under different situation. According to him, freshly harvested seed, if place in alternating temperature of 25^{0}C (16hr) and 35^{0}C (8hr) under soil moisture maintained between 10 to 15%, produced 55 to 65% germination. Datta et al., (1963) found 62.77 percent germination in freshly collected heavy seed lots, harvested during October to November under Jammu condition. Saini (1969) reported that in old seeds accumulation of hydroxyl – aromatic acid (through breakdown of phenolic acid and aromatic compounds) inhibited seed germination.

Commercially, the plant is usually propagated by seed. The percentage of germination of seeds is quite variable, ranging from 10-60 %. This is partly attributed to the adverse influence of the stony endocarp. The rate of germination, however, depends on the percentage of fully matured, heavy seeds in a particular lot. Fresh

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seeds, collected from ripe fruits and immediately sown, show a higher percentage of germination. The ripe seeds collected from the beginning of June to the end of October or even November and stored in air tight bins, retained their viability for about 6 months. The viability of the seeds drops markedly with the increase in the interval of time between collection and sowing. The germination rate of the seed also differs under varying agro climatic conditions. Maheshwari devi et al., (1982) stated that germination was 86% and 53.3% respectively, in 2 batches of seed collected in India, indicating that propagation by seeds in *Rauvolfia* alternative to the use or stem of root cutting.

It is reputed in the traditional system of medicine as a febrifuge. A remedy for snake bites a cure for dysentery and afflictions of the intestine. Reserpine latter acquired a global reputation as the main hypotensive and sedative agent. *Rauvolfia* is an important genus, hold a unique position being a source of therapeutically significant alkaloids, this fact was first pointed out by Greshoff (1890). Court (1983) reported the distribution of alkaloids in the leaves, stems and roots of ten African *Rauvolfia* species. It was noted that almost all the alkaloids in these species belong to ajmaline group.

Verpoorte et al., (1997) reported the role of macro and micronutrients in several enzymes involved in the biosynthesis of terpenoid, indole alkaloids in *Catharanthus roseus*. It has health promoting properties of metals was recognized and had been use in traditional system of medicine. The metals from organic and inorganic sources are being used (Rajesekaran et al., (2005), Ernst, (2002) and Gomez et al., 2004). Bordia et al., (1995) analyzed dry tubers for their mineral composition. Na content in tuber was (0.04 mg/g), K (0.80 mg/g), Ca (6.6 mg/g), Mg (1.9mg/g), P (3.2 mg/g), Zn (0.002 mg/g) and Cu (0.148 mg/g). Silvia et al., (2005) reported elemental composition of commercial Valerian (*Valeriana officinalis*) roots from Argentina. Concentrations of Fe were in the range of 100 – 1000 mg/kg; Mn and Zn in the range of 10 – 100 mg/kg). Shrivastava and Singh (2007) reported an increasing response of different micronutrients on the citrus trees has been invariably obtained.

MATERIAL AND METHOD:

The experiment was conducted on ***Rauvolfia serpentina*** (L.) at Botany department, RTM Nagpur University, Nagpur (M.S.). 150 cc size volume root trainers were used for growth of seedlings. RBD with three replications and ten seedlings were taken in each replication, thus total 30 seedlings per treatments were studied. Sample I include only soil, sample II with uniform potting mixture of soil, compost, burnt rice husk and charcoal granules and sample III with potting mixtures (soil, sand and compost) filled in the root trainers. The samples were collected for physiochemical properties of potting media. Soil samples were collected from Nagpur, PGTD Botany campus, RTM Nagpur University, Nagpur for micro and macronutrients status. Samples were taken from Chandrapur to study the effect of different potting media on root trainer seedlings. Soil analysis was done at N.B.S.S. Nagpur and P.G.T.D. of Botany, RTM Nagpur University. Physiochemical properties of soil i.e. pH (7.2), moisture content (0.12), electrical conductivity (0.03 dSm^{-1}), available macronutrient N (75 Kg/ha), P (33.60 Kg/ha), K (249.3 Kg/ha), Ca (29.50), Mg (10 Kg/ha) and micronutrients Fe (22 Kg/ha), Mn (34 Kg/ha), Zn (10.02 Kg/ha), and Cu (9.16 Kg/ha) were analyzed to study their nutritional influence.

Stepwise application of macro and micronutrients of *Rauvolfia serpentina* (L.): After seedlings transfer into field, individual element was applied in the field after 12 days interval in stepwise manner enabling to study its influence on growth and development of plants till that becomes 108 days old. Element N_2 were

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applied to plants 12th days, P 24th days, K 36th days, Ca 48th days, Mg 60th days, Fe 72th days, Mn 84th days, Zn 96th days and Cu on 108th days after transplantation in the field.

Application of macro and micronutrients were given in following steps.

P0 – Control

P1 - 50KgN+30KgP+5KgK+40KgCa+26KgMg+5KgFe+20KgMn+6KgZn+4KgCu

P2 - 55KgN+35KgP+10KgK+45KgCa+30KgMg+8KgFe+25KgMn+8KgZn+6KgCu

P3 - 60KgN+40KgP+15KgK+50KgCa+34KgMg+11KgFe+30KgMn+10KgZn+8KgCu

P4 - 65KgN+45KgP+20KgK+55KgCa+38KgMg+14KgFe+35KgMn+12KgZn+10KgCu

P5 - 70KgN+50KgP+25KgK+60KgCa+42KgMg+17KgFe+40KgMn+14KgZn+12KgCu

P6-75KgN+55KgP+30KgK+65KgCa+46KgMg+20KgFe+45KgMn+16KgZn+14KgCu

RESULT AND DISCUSSION:

Influence of elements on root yield and yield attributing characters of *Rauvolfia serpentina*

Data recorded in above table revealed that application of combined macro and micronutrient with F_1 and F_2 resulted significant increase in the root yield over control in *Rauvolfia serpentina.* The highest root yield was obtained with P_5 (70: 50:25: 60:42: 17: 40: 14: 12 kg/ha N, P, K, Ca, Mg, Fe, Mn, Zn, Cu respectively) treatment was significantly superior over control, the preceding treatment (P_1 to P_4) and succeeding treatment (P_6).

The interaction effect between macro and micronutrient fertilizer combinations with F_2 field plant influenced the root yield significantly. Highest root yield was obtained in F_2P_5 (70: 50:25: 60:42: 17: 40: 14: 12 kg/ha N, P, K, Ca, Mg, Fe, Mn, Zn, Cu) treatment followed by F_2P_4 (65:45: 20: 55: 38: 14:35: 12: 10 kg/ha N, P, K, Ca, Mg, Fe, Mn, Zn, Cu respectively). Both the treatment was found at par and significantly superior over rest of the treatments.

In F_2P_5 treatment highest dry root yield (914 kg/ha) and yield attributing characters, maximum plant height (59 cm) , no. of leaves not significant (54.67) for nutrient combination level (70: 50:25: 60:42: 17: 40: 14: 12 kg /ha N, P, K, Ca, Mg, Fe, Mn, Zn, Cu respectively) while In F_2P_4 dry root yield (836.65 kg/ha), plant height (57 cm) and no. of leaves (53) for nutrients application was (65:45: 20: 55: 38: 14:35: 12: 10 kg/ha N, P, K, Ca, Mg, Fe, Mn, Zn, Cu respectively).

In F_1P_6 lowest dry root yield (554.67 Kg/ha), plant height (44.03 cm) and no. of leaves (32) was obtained for nutrient application (75: 55:30: 65: 46: 20: 45:16: 14 kg/ha N, P, K, Ca, Mg, Fe, Mn, Zn, Cu respectively). In F_1P_5 treatment dry root yield was (833.32 kg/ha), plant height (54.07 cm) and no. of leaves (52) for nutrient application (70:50:25:60:42:17:40:14:12 kg/ha N, P, K, Ca, Mg, Fe, Mn, Zn, Cu respectively).

The interaction effect of (F_2P_5) treatment was comparatively higher dry root yield, maximum plant height, and maximum no. of leaves as compared to (F_1P_5). Therefore (F_2P_5) treatment was more effective than other higher and lower treatment of macro and micronutrients and control.

CONCLUSION :

From the above result, the study showed that there might be different medicinal plants response to different fertilizers application; hence need to determine the fertilizers requirement to medicinal plants for production of highest yield and increases medicinal values.

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Table-1: Influence of elements on dry root yield and yield attributing Character of *Rauvolfia serpentina*

Field plants	Plant height (cm)	No. of leaves	Dry root yield. (Kg /ha)
F_1	48.25	40.38	644.19
F_2	50.48	43.65	685.33
SE(m)±	0.21	0.34	4.14
CD at 5%	0.62	0.99	12.08
Fertilizer treatment combination			
P_0	43.58	33.50	571.67
P_1	46.45	35.32	582.32
P_2	47.73	38.83	596.68
P_3	52.16	47.65	688.33
P_4	54.05	51.16	776.64
P_5	56.85	53.35	873.69
P_6	44.28	34.38	564.00
SE(m)±	0.40	0.64	7.75
CD at 5%	1.16	1.86	22.60
Interaction (FxP)			
F_1P_0	43.06	31.36	566.67
F_1P_1	46.16	32.65	574.68
F_1P_2	47.13	37.32	583.32
F_1P_3	50.66	47.39	680.00
F_1P_4	52.00	49.35	716.69
F_1P_5	54.07	52.00	833.32
F_1P_6	44.03	32.00	554.67
F_2P_0	44.01	35.34	576.56
F_2P_1	46.73	38.00	590.00
F_2P_2	48.33	40.32	610.00
F_2P_3	53.64	48.00	696.64
F_2P_4	57.00	53.00	836.65
F_2P_5	59.00	54.67	914.00
F_2P_6	44.53	36.32	573.34
SE(m)±	0.56	0.90	10.97
CD at 5%	1.65	NS	31.96

Field plants - (F_1) - Soil used in root trainers and their seedlings transplanted into field.
(F_2) - Compost mixtures used in root trainers and their seedlings transplanted into field.

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Plate - 8

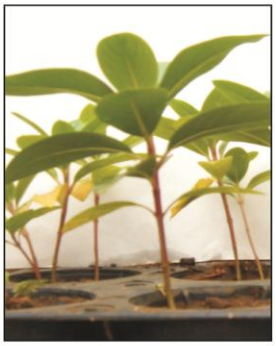
Seedling growth of Medicinal Plants in Root Trainer

T_1 = Soil
T_2 = Soil + Compost + Burn rice hurk + Charcoal granule
T_3 = Soil + Sand + Compost

Vinca rosea

T_1

T_2



T_3

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