

PRUNING INFLUENCE ON ROOT YIELD AND QUALITY OF *PLUMBAGO ROSEA*

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Abstract: *Plumbago rosea* (Plumbaginaceae) is a perennial herb, commonly cultivated in India for its medicinal value. Influence of pruning on root yield and quality of *Plumbago rosea* was studied at All India Coordinated Research Project on Medicinal, Aromatic Plants and Betel Vine, College of Horticulture, Kerala Agricultural University, Vellanikkara, Kerala, India, during 2011-2013. The experiment was laid out in split plot design with three replications. The treatments included three stages of pruning (9 MAP, 12 MAP and 15 MAP) in main plots and three pruning heights (15 cm, 30 cm and control with no pruning) in sub plots. Both stage of pruning and height of pruning significantly influenced the root yield and quality of *Plumbago rosea*. The highest root yield of 259.30g/plant (5081 kg/ha) were observed when *Plumbago* plants were pruned at 15 months after planting. Among sub plot treatments, 30 cm pruning gave the highest root yield of 5049 kg/ha. As compared to plants with no pruning, 14.6 per cent increase in the yield was observed in plants with pruning. The content of major alkaloid plumbagin, was higher in plants which received pruning at 9 months after planting (0.86 per cent). Since the plant is propagated vegetatively through semi hard wood cuttings, branches removed through pruning can be utilized for propagation and can earn additional income.

Key words: *Plumbago rosea*, Plumbagin, Pruning, Root yield.

Introduction: *Plumbago rosea*, also known as *Plumbago indica* (Plumbaginaceae) is one of the common medicinal plants used in Indian traditional system of medicine. They are commonly known as scarlet leadworts or Chithrak. The freshly harvested roots after curing and drying are used for many ayurvedic preparations like Chitrakasavam, Chitrakachurnam, Dasamularistam, Gulgulutiktakam, Yogarajachurnam etc. (Warrier *et. al.*, 1997). The roots are digestive stimulants. It is pungent, astringent, diuretic, germicidal and abortifacient. It overcomes flatulence, oedema, piles, coughs, and worm infections. The drug also cures enlargement of abdomen, anaemia, diabetes, leucoderma, leprosy, diarrhoea, and elephantiasis.

Cultural practices can alter yield and quality of plants especially that of medicinal plants. Pruning is such a practice which alters the source sink relation in plants. *Plumbago rosea* is propagated vegetatively through two to three node stem cuttings. Normally the plant produces 10-12 branches. These branches can be pruned before harvest and can be utilized for vegetative propagation, making an additional income for the growers. Before recommending such practice it is necessary to assess the effect of removal of branches on yield and quality. Hence the study was conducted to assess the effect of pruning stages and pruning heights on yield and quality *Plumbago rosea*.

Materials And Methods: The experiment was conducted at All India Coordinated Research Project on Medicinal, Aromatic Plants and Betel vine (AICRP on MAP&B), Thrissur, Kerala, India during May 2011 to December 2013. The experimental site enjoys a typical humid tropical climate. The place lies between 13° 32'N latitude and 76° 26'E longitude with an

elevation of about 40 m from MSL. The soil was lateritic sandy loam of the Oxisol group with 47.6% sand, 20.8% silt, 31.3% clay, 0.44% organic carbon, 240.10 kg/ha available N, 35.07 kg/ha available P, 225.89 kg/ha available K and a pH of 5.4.

The experiment was laid out in split plot design with three main plots and three sub plots, replicated thrice. The main plot treatments were three pruning stages *viz.* 9 months after planting, 12 months after planting and 15 months after planting and sub plots included pruning heights of 15 cm, 30 cm and control (no pruning). The land was prepared by ploughing and leveling. Three month old rooted two noded semi hardwood cuttings were planted at spacing of 50 cm x 50 cm in the month of June. Cattle manure @ 10 t ha⁻¹ was applied as basal at the time of land preparation. The fertilizers were applied @ 50:50:50 kg ha⁻¹ N:P₂O₅:K₂O. Entire P₂O₅ was applied as basal and N and K₂O in two split doses, two months and four months after planting (KAU, 2011).

Earthing up and weeding was done two times along with topdressing of fertilizers. Pruning was done as per treatments. The crop was harvested at 18 months after planting. Roots after harvest were cleaned and observations were recorded. Plumbagin content was estimated spectrophotometrically at 520nm (Shalini *et. al.*, 2010).

Results And Discussion:

Root yield: Pruning stage and heights significantly influenced the root yield of *Plumbago*. The highest root yield of 259.30g/plant (5081 kg/ha) was observed when *Plumbago* plants were pruned at 15 months after planting (Table 1). The per plant yield and per unit area yield decreased significantly when plants were pruned at 12 months after planting (138g/plant

and 4510 g/plant respectively). Among sub plots, the root yield was the highest in plants which received pruning at a height of 30 cm (5049 kg/ha). As compared to plants with no pruning, 14.6 per cent increase in the yield was observed in plants with pruning. Though the root yield in plants pruned at a height of 15 cm was lesser than 30 cm pruned plants,

compared to non pruned plants, 8.9 per cent yield increase was noticed. According to Pathiratna (2005) in *Piper longum* pruning of runners at a distance of 40 cm from the base of the mother plant induced the formation of more number of reproductive branches and spikes.

Table 1. Effect of stage of pruning and pruning height on yield and plumbagin content of *Plumbago rosea*

Treatment	Fresh root weight (g/plant)	Fresh root weight (kg/ha)	Plumbagin(%)
Pruning stage			
9 MAP	167.78	4665	0.86
12 MAP	138.00	4510	0.78
15 MAP	259.30	5081	0.84
CD(0.05)	25.35	515.1	0.04
Pruning height			
15 cm	173.33	4801	0.84
30 cm	211.00	5049	0.83
No pruning	181.10	4407	0.81
CD(0.05)	30.13	310.2	NS
CV(%)	11.48	7.46	3.02

Table 2. Interaction effect of stage of pruning and pruning height on yield and plumbagin content of *Plumbago rosea*

Treatment	Fresh root weight (g/plant)	Fresh root weight (kg/ha)	Plumbagin(%)
9 MAP x 15 cm	146.67	4920	0.85
9 MAP x 30 cm	166.67	4747	0.90
9 MAP x No pruning	190.00	4330	0.84
12 MAP x 15 cm	123.30	4313	0.81
12 MAP x 30 cm	182.00	4767	0.78
12 MAP x No pruning	110.00	4450	0.76
15 MAP x 15 cm	250.00	5170	0.85
15 MAP x 30 cm	284.67	5633	0.82
15 MAP x No pruning	143.33	4440	0.84
CD (0.05)	40.75	667.1	0.06
CV(%)	11.48	7.46	3.02

Interaction effect of pruning stages and heights were also significant with the highest root yield in treatment combination of 15 MAP x 30 cm (284.67 g/plant and 5633kg/ha). Pruning at a height of 15 cm at 15 months after planting was the next best alternative for higher root yield of *Plumbago rosea* (Table 2). Nabizadeh *et. al.*, (2011) reported significant influence of pruning on improving yield and yield attributing factors of castor.

Plumbagin content: Stage of pruning significantly influenced the quality of *Plumbago rosea*. The quality as indicated by content of major alkaloid plumbagin, was higher in plants which received pruning at 9

months after planting (0.86 per cent). However, it was statically on par with 15 MAP pruning (0.84 per cent). Plumbagin content reduced significantly when plants were pruned at 12 month stage.

Significant interaction between stage of pruning and pruning heights were also observed with respect to plumbagin content. Plants which received pruning at 9 months after planting at a height of 30 cm gave the highest plumbagin content of 0.90%. Pruning at a height of 15 cm either at 9 MAP or at 15MAP were the next best treatments with respect to quality (0.85 per cent). According to Pal *et. al.*, (2014) pruning at a height of 90 cm from the ground level is ideal for

increasing the number of flowers and oil quality in *Rosa damascena*.

From the results, pruning can be recommended as a cultural practice for improving yield and quality in *Plumbago rosea*. Branches can be pruned at 9 and 15 months after planting and can be utilized for

vegetative propagation without distressing the yield or quality.

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References:

1. KAU [Kerala Agricultural University]. Package of Practices Recommendations -Crops (14th Ed.). Directorate of Extension, Kerala Agricultural University, Thrissur, 2011, p360.
2. E. Nabizadeh, E. Taherifard, and F. Gerami, 2011. Effect of pruning lateral branches on four varieties of medicinal castor bean plant (*Ricinus communis* L.) yield, growth and development. *Journal of Medicinal Plants Research*. 5(24):5828-5834
3. P. K. Pal, V.K. Agnihotri, Gopichand, and R, D. Singh. 2014. Impact of level and timing of pruning on flower yield and secondary metabolites profile of *Rosa damascena* under western Himalayan region. *Industrial Crops and Products*. 52: 219-227
4. L.S.S. Pathiratna, K.D.S.M. Joseph, M.K.P. Perera. 2005. Development of suitable propagation techniques and management practices for the cultivation of the medicinal plant *Piper longum* L. *Ceylon Journal of Science, Biological Sciences*. 33: 45-53.
5. Shalini, Israni, S. Nayana, Kapadia, K. Suman, Lahiri, K. Gunvat, Yadav, B. Mamta. and Shah. 2010. An UV-Visible Spectrophotometric Method for the Estimation of Plumbagin. *International Journal of ChemTech Research*. 2(2): 856-859
6. P.K. Warriar, V.P.K. Nambiar, C. Ramankutty. (Eds.) 1997. *Indian Medicinal Plants, A Compendium of 500 Species*, Vol. IV. Orient Longman Ltd., Madras, India. 321p.

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