

Response of nitrogen fertilization and pruning on the regulation of photosynthate partitioning in ashwagandha (*Withania somnifera*, L.) – A potential medicinal plant for agroforestry landuse systems

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SUMMARY

Ashwagandha has been identified as a potential cash crop for greening the dry land zone and making the wasteland productive. It is mentioned as an important drug in the ancient Ayurvedic literature. Its roots used to be prescribed for hiccup, female disorders, cough, rheumatism, dropsy, anti-inflammatory and neuro tonic properties. With the growth of ayurvedic industry there is great demand for the raw material of medicinal plants. Keeping this in view, studies were conducted for the diversion of photosynthate to sink part (root) which is of economic interest by means of pruning (25% and 50%) accompanied by different nitrogen level (15, 30, 60 kg N ha⁻¹). Significant increase in root length and volume was observed with pruning and nitrogen treatments after 135, 150 and 180 days of transplanting. With the application of 15 kg N ha⁻¹, 3 cm increase in root length was recorded at 180 days of transplanting. The application of 30 and 60 kg N ha⁻¹ did not affect root length significantly. In root length maximum increase was observed with 25 per cent pruning i.e. of 10 cm. Interaction of both leads to additive response and 13 cm increase in root length after 180 days of transplanting. Pruning (25%) and 15 kg N ha⁻¹ showed double the volume of the root, whereas interaction study showed drastic increase in volume i.e. 3 times after 135 days of transplanting. Significant increase was also seen after 150 and 180 days of transplanting.

Key words: Photosynthate, Pruning, Nitrogen, Ashwagandha.

Ashwagandha (*Withania somnifera* L.) an important medicinal plant, being a major source of ayurvedic drugs belongs to family Solanaceae. It is an erect, bushy, evergreen perennial shrub, 30-150 cm high found throughout the drier part of India in dry wastelands. Ashwagandha is grown for its roots due to the presence of different alkaloids. In the vast rainfed areas of Himachal Pradesh where other crops can not be grown profitably Ashwagandha can be cultivated as cash crop.

Singh *et al.* (1975) in a field study on green gram (*Phaseolus aureus* L.) found that phosphorus and nitrogen significantly increased the grain yield. Nigam *et al.* (1985) reported an increase in dry root yield but not very significant with nitrogen and phosphorus level. Photosynthate partitioning in alfalfa was influenced by a distance from source to sink (Cralle and Heichel, 1988). Li *et al.* (1991) studied the source sink relationship of different plant parts of a semi-determinate soybean (*Glycine max*) by removing the leaves of different section. The present investigation was undertaken to improve the ashwagandha quality, quantity with different agrotechniques; like proper fertilization schedule, spacing and different pruning levels in percentage so that the photosynthate in leaves can get diverted to roots which is of economic interest.

MATERIALS AND METHODS

Experiments were conducted at research farm of Department of Plant Physiology, CSKHPKV, Palampur. Seeds were procured from Regional Research Laboratory (CSIR, J&K). The field trails were conducted in RBD plots of size 1.5 x 2.5 m² with six replications. Before transplanting,

land preparation was carried out by mixing farm yard manure and applying basal dose of fertilizers. Nitrogen was applied in the form of urea (46 per cent nitrogen) and phosphorus through single super phosphate (16 per cent water soluble phosphorus). The seedlings were transplanted at a distance of 30 x 30 cm (row to row). Plants were sprinkled with water as and when required.

Important operations schedule

1. Date of sowing of seed - 20th July and August
2. Date of transplanting - 15 Sep, 2000
3. Nitrogen application - At the time of sowing
- 45 days after transplanting
- 90 days after transplanting
4. Time of pruning - 25 April, 2001

Plant were also protected against 'hadda beetle' (*Epilachna dodcastigma*) by drenching with 2 per cent solution of 2, 4 Dithane M-45.

The data on various parameters recorded during the course of investigation were subjected to statistical analysis.

RESULTS AND DISCUSSION

The average root length, root volume and dry weight showed an increase with increase in number of days after transplanting from 135 to 180 days, along with nitrogen and pruning. The maximum root length of 27.75 cm was recorded at 180 days followed by 21.27 cm at 150 days and 20.26 cm at 135 days with the application of 15 kg N ha⁻¹. But, the application of either 30 or 60 kg N ha⁻¹ did not

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