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## **Study of Growth Rate and Cultivation Practice in *Asparagus racemosus* (Liliaceae)**

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### ABSTRACT

*Asparagus racemosus* belongs to member of family Liliaceae (Shatavari), are valuable medicinal plant. Due to its various notable medicinal properties, it is used widely and facing over exploitation problem. The current cultivation practices are based on the study of absolute growth rate of plant in nursery control cultivation condition. Root and stem growth rate were studied and found that per day growth in cm is significantly higher than the growth at natural condition. This will helps to increase production of plant as per demands and needs.

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Keywords: *Asparagus racemosus*, Medicinal Plant, Cultivation, Root, Shoot and Growth Rate

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### **1. Introduction**

The genus *Asparagus* consisted of about 300 species around the world, out of which around 22 species are recorded in India. *Asparagus racemosus* is widely spread and distributed across the world from tropical Australia, Sri Lanka, Africa, China and India, but *Asparagus racemosus* is mainly cultivated in Indian subcontinents. *Asparagus racemosus* belongs to the family Liliaceae commonly known as Shatavari, having many medicinal important and used in immunomodulatory (Diwanay *et al.*, 2004). Medicinal properties of *A. racemosus* are recorded in traditional Ayurvedic medicine, Siddha and Unani medicinal system (Gautam *et al.*, 2004).

Plant is having its peculiar chemical constituents like steroidal saponins named as shatavarin I-IV (Hayes *et al.*, 2008) and an alkaloid asparagamine A (Sekine *et al.*, 1995). Leaf extract in ethanol shows anti-inflammatory effect in rats (Battu *et al.*, 2010) were root extract are having antioxidant activity (Wiboonpun *et al.*, 2004; Bhatnagar *et al.*, 2005).

The plant has many therapeutic application *viz.* diuretic, antidepressant, antioxidant, antiepileptic, antidepressant, antitussive, anti-HIV, immunostimulant, antidepressant, hepato-protective and cardio-protective. The key important studies were reported using plants extracts and found active principle involved in it and also needs to explore it. Formulations containing *Asparagus racemosus* are with major ingredient in it with numerous properties against disorders. This reflects the therapeutic as well as economic importance of *Asparagus racemosus* worldwide. Its safe when used in therapeutic doses also is used in pregnancy. Hence the medicinal properties of plants depends on the availability of active principle present in it, so the uniformity in quality, quantity of planting material are the paramount importance for their supply (Bhatnagar *et al.*, 2005).

In India, *Asparagus racemosus* root extract is conventionally utilized during internal pain, fever, tumors, and used as a tonic. Roots of *A. racemosus* are used as a remedy for epilepsy, tumors, tuberculosis, night blindness leprosy, dysentery and inflammations (Wiboonpun *et al.*, 2004). Fresh juice from tuber is given orally in dysentery, acidity and to increase the breast milk after delivery. Medicated oil prepared from tubers is beneficial for nervous and rheumatic complaints (Battu *et al.*, 2010 and Zhang *et al.*, 2013).

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## 2. Morphology

Shatavari is common name of *A. racemosus* is a climbing with tuberous roots. Small pin-needle like phylloclades, uniform and shiny green. Roots 5-15 cm and 2 cm in length and thickness respectively. Roots smooth when fresh, and wrinkles present upon drying. Microscopically the inner parenchyma zone of cortex. Cells are thin-walled, cellulosic fibers; with circular to oval outlines. Some roots are 3-4 layers of cortex immediately adjacent to the endodermis and are modified into a sheath of stone cells on round the endodermis (Bhupendra K. Dorkar 2019).

Due to huge demands of plant in medical aspects over exploitation of plant is happen, because of its overuse from natural habitat. The current research work is based on the cultivation and study of growth pattern in Shatavari with respect to root and shoot growth in control condition (Khare, C.P 2007). Environmental factors also effects on plant growth rate, but much information can be achieved by proper getting information about absolute growth rate of a plant adapts to constant environmental conditions. For example, if plant growth rate is dependent on irradiance factor. In poplar way rates of growth in leaf (width/length) are independent of irradiance factor (Pieters 1983). The same concept is more correct in the case of sunflower leaves (Pieters 1985). Irradiance factor does affect on the leaf size (Pieters 1985), but it effects on the duration of growth from the time. The effect of irradiance factors on leaf must be through an effect on the size of the primordium of leaf (Goyal *et al.*, 2003 and Hussain *et al.*, 2011).

## 3. Material and Methods

For the current experiments *Asparagus racemosus* plant sample has been collected during botanical excursion from Forest area near by Amravati district. Plant is collected during 2018-2019 with their seeds and identified in laboratory with the help of local flora. Seeds were used for cultivation and ten different replicate has been made in nursery with different soil mixture ratios and sowing depths. The actual increases in the size of a plant were calculated with stem and root size (in cm) together after 90 days of cultivation for each plant in all ten replicate for each and pattern of growth is represented with tabular and graphical representations. Germination percentage of plant was recorded daily. Plant collar diameter, its heights, size and over all biomass (dry weight) and seedlings was measured after a month for further experimental purpose (Bhupendra K. Dorkar 2018).

## 4. Results and Discussion

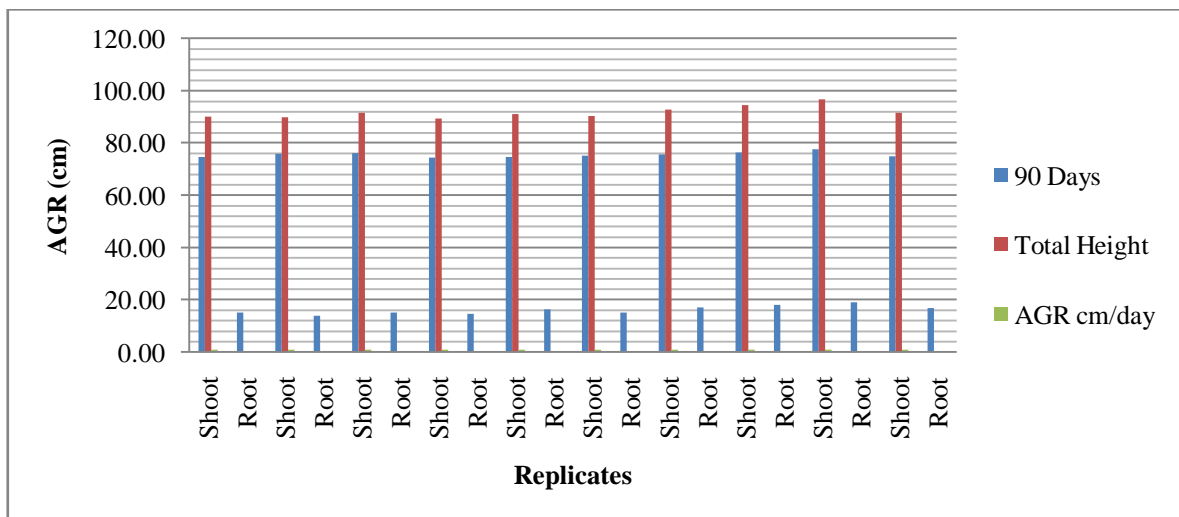
**Absolute Growth Rate (AGR):** Shoot and root length were calculating for absolute growth rate (AGR) per day for *Asperagus racemosus* in cm. It was found that  $1.02 \pm 0.0259$  AGR per day is present under observation for all ten replicate of *Asperagus racemosus* current observation as represented in Table 1.0 and Graph 1.0

Table 1.0 *Asperagus racemosus* Willd.

Replicate of Plant	Length in cm	AGR								
		15 Days	30 Days	45 Days	60 Days	75 Days	90 Days	Total	AGR cm/day	% AGR
Replicate 1	Shoot	34.40	51.20	60.20	66.00	68.50	74.80	90.10	1.00	1.020
	Root	5.10	8.00	10.00	11.50	12.10	15.30			
Replicate 2	Shoot	35.30	52.60	61.50	65.20	68.00	75.80	89.80	1.00	
	Root	5.10	8.00	10.00	10.50	12.90	14.00			
Replicate 3	Shoot	35.20	52.70	60.40	66.50	67.90	76.20	91.50	1.02	
	Root	4.40	8.00	11.10	10.50	13.00	15.30			
Replicate 4	Shoot	34.20	52.90	62.10	67.10	68.50	74.50	89.30	0.99	
	Root	5.30	8.20	11.50	10.20	14.00	14.80			
Replicate 5	Shoot	36.20	53.10	63.50	65.20	67.40	74.60	91.10	1.01	
	Root	6.50	9.50	11.20	11.80	13.50	16.50			
Replicate 6	Shoot	34.50	51.80	62.10	65.90	67.10	75.10	90.30	1.00	
	Root									

<b>Replicate 7</b>	Root	4.80	8.50	10.50	11.50	12.00	15.20	92.70	<b>1.03</b>
	Shoot	34.50	52.30	62.70	66.20	69.20	75.60		
<b>Replicate 8</b>	Root	5.00	8.90	10.00	11.20	13.60	17.10	94.50	<b>1.05</b>
	Shoot	34.80	53.10	63.40	66.00	68.50	76.40		
<b>Replicate 9</b>	Root	5.60	7.90	9.90	10.00	12.00	18.10	96.80	<b>1.08</b>
	Shoot	32.90	51.90	62.70	64.90	65.20	77.60		
<b>Replicate 10</b>	Root	5.60	8.50	10.40	11.00	13.10	19.20	91.70	<b>1.02</b>
	Shoot	34.70	52.40	63.40	65.20	68.20	74.90		
<b>Total</b>	Root	<b>4.00</b>	<b>9.10</b>	<b>10.70</b>	<b>10.30</b>	<b>10.00</b>	<b>16.80</b>		<b>1.02</b>

GR with SD= 1.02±0.0259



Graph no. 1.0: Absolute Growth Rate in *Asperagus racemosus*

## 5. Conclusion

*A. racemosus* is an important medicinal plant with much therapeutic ability. In current cultivation study authors have seen that the plant is used for many purposes and reflect various biological activities. Absolute growth rate (AGR) per day for *Asperagus racemosus* was measured in cm for shoot and root growth of plant. It was found that  $1.02 \pm 0.0259$  AGR per day are found in cultivated condition which significantly higher than natural habitats growth rate. It may due to the soil, fertilizer, proper water and supply of good nutrients in nursery or cultivated treatments. Hence the method of cultivation are beneficial for which can full filled the demands of plants for various purpose. Due to this, alternative strategies for propagation and conservation are urgently required to prevent the species being threatened.

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