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Performance of *Picrorhiza kurrooa* Royle ex Benth under different growing media

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ABSTRACT

Picrorhiza kurrooa commonly known as Kutki/Karru is high valued medicinal plant categorized as endangered by the IUCN and finds use both in traditional as well as modern system of medicine. Increasing national and international demand with good market price leading to its indiscriminate and unscientific exploitation from the wild coupled with negligible cultivation has put its existence under threat. In order to find out the best growing medium for cultivation sprouting, survival, growth and yield performance of *P kurrooa* was tested under six different media viz soil (1), soil + sand (2:1), soil + sand + FYM (2:1:1), soil + sand + vermicompost (2:1:1), soil + sand + sheep manure (2:1:1) and soil + sand + humus (2:1:1). After three years of experimentation it was deduced that following media should be used in the increasing order of their preference: soil + sand + FYM (2:1:1) >soil + sand + vermicompost (2:1:1) >soil + sand + sheep manure (2:1:1) >soil + sand + humus (2:1:1) to maximize sprouting, survival and yield of *P kurrooa.*

Keywords: *Picrorhiza kurrooa;* growing media; sprouting; survival; leaf; root stock; root stock/shoot ratio

INTRODUCTION

Picrorhiza kurrooa commonly known as Kutki is one of the important high altitude medicinal plants. The commercial drug is obtained from dried stolons and roots and is used as bitter tonic, hepato-protective, anti-periodic, cholagouge, stomachich, anti-amoebic, anti-cancerous, anti-oxidant, laxative in small doses and cathartic in large doses, carminative, anthelmintic, anti-inflammatory, immuno-stimulant and cardio-tonic. It also finds use in dropsy, asthma, leprosy, arthritis and is also considered as blood purifier, blood pressure reducer, cardiac and expectorant. The local inhabitants use this plant in fever and stomachic troubles. The root paste is applied to cuts and wounds for speedy healing. Thus cultivation of *Picrorhiza* can provide not only an alternate income generating resource but can also provide the opportunity for self-employment (Nautiyal et al 2001).

Due to its narrow distribution range, small population size and high value the species figure among the 37 identified top priority species for conservation and cultivation in western Himalaya. Besides these facts the existing information of the species is inadequate especially with regard to availability of its agro-practices. Moreover high commercial demand of *P kurrooa* coupled with good market price is attracting herbal traders while scanty attention is being given to its conservation or cultivation. The resulting decline in its natural regeneration has not only put its existing population under threat but has also adversely affected the trade and commerce of related industries.

Keeping in view the increasing demand for *P kurrooa* as a herbal drug its assessment as an endangered species in nature and consequently the need for its cultivation to raise the economy of poor especially in the Himalayan region it becomes imperative to initiate steps for cultivation of this species at lower altitude near the vicinity of villages. This is the only way by which this species can be saved from extinction. For its sustainable utilization large scale cultivation is necessary and by doing so local people will get an alternate option of income generation to improve their livelihood and an opportunity for self-employment. So present work was undertaken to standardize the best growing media using vegetative parts since the survival rate of this plant from seed is very low.

MATERIAL and METHODS

The present investigations were undertaken at Medicinal and Aromatic Plants Research Station, Rahla of Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan, HP during 2005 to 2007. The station is located at an altitude of 2,750 m amsl. The surface (0-15 cm depth) and sub-surface (15-30 cm depth) soil of the experimental site was acidic in reaction (pH 5.5 to 5.7) with safer EC value (0.091 to 0.115 ds/m), medium to high in organic carbon (1.92 to 1.68%) and available N (407.68 to 332.41 kg/ha), P (44.80 to 40.32 kg/ha) and K (333.40 to 296.80 kg/ha). The area with deep fertile soil and nice undulating topography receives heavy snowfall and is highly conducive for cultivation of medicinal and aromatic plants of temperate and alpine region.

The studies elucidate sprouting, survival and yield performance of *Picrorhiza kurrooa* employing different growing media viz soil (1), soil + sand (2:1), soil + sand + FYM (2:1:1), soil + sand + vermicompost (2:1:1), soil + sand + sheep manure (2:1:1) and soil + sand + humus (2:1:1) to find out the most suitable one for better sprouting, survival and yield. Six cm long stolon cuttings were planted in polybags in May 2005. The experiment was laid out in a randomized block design with four replications having 50 plants in each replication.

Sprouting was recorded by counting the number of cuttings sprouted after four months of planting and field survival of rooted cuttings was recorded in the second year of plant growth by counting the number of survived plants at the end of the growing season. For leaf and rootstock yield randomly selected five plants per replication were dug out at the end of growing season in the month of October when the plants were in their second and third year of growth. The plants were washed thoroughly to remove all adhering soil particles. These were then sun-dried for two days followed by shade drying for ten to fifteen days and oven drying at 50°C till no further weight loss was observed. These oven dried plant samples were separated into leaves and rootstock (stolon plus roots), weighed and expressed in g/plant and kg/ha. Rootstock/shoot ratio was calculated by dividing rootstock weight by shoot weight.

RESULTS and DISCUSSION

Sprouting: A perusal of data (Table 1) recorded in October 2005 reveal that treatment T_5 (soil + sand + sheep manure 2:1:1) induced highest sprouting (92.00%) followed by growing of *Picrorhiza kurrooa* in T_6 (soil + sand + humus 2:1:1) (90.20 %) and T_4 (soil + sand + vermicompost 2:1:1) (90.00 %) whereas lowest (70.00 %) sprouting was noticed in T_1 (soil alone) followed by T_2 (soil + sand 2:1) (72.12 %).

Survival: Plant survival (Table 1) was recorded highest (82.84%) by growing the stolon cuttings in T_6 (soil + sand + humus 2:1:1) followed by growing in T_5 (soil + sand + sheep manure 2:1:1) with 80.86 per cent survival. However both T_5 and T_6 behaved statically alike. Growing *P kurrooa* in soil alone (T_1) exhibited lowest survival (62.62%) following T_2 (soil + sand 2:1) exhibiting a value of 67.14 per cent.

Leaf Yield: It is evident from Table 1 that leaf yield was highest (0.69 and 2.01 g/plant) in T_5 (soil + sand + sheep manure 2:1:1) followed by T_6 (soil + sand + humus 2:1:1) (0.68 and 2.00 g/plant), T_4 (soil + sand + vermicompost 2:1:1) (0.61 and 1.93 g/plant) and T_3 (soil + sand + FYM 2:1:1) (0.59 and 1.91 g/plant) in the second and third year of plant growth respectively. However all these treatments viz T_3, T_4, T_5 and T_6 behaved statistically alike. Lowest (0.39 and 1.71 g/plant) leaf yield was observed in T_1 (soil) followed by T_2 (soil + sand 2:1) (0.41 and 1.73 g/plant) at the end of second and third year of growth respectively. However both the treatments T_1 and T_2 remained statistically at par with each other.

Rootstock yield: A perusal of data (Table 1) reveal that at the end of second year of growth highest rootstock yield (1.60 g/plant and 256.00 kg/ha) was obtained in T_6 (soil + sand + humus 2:1:1) followed by T_5 (soil + sand + sheep manure 2:1:1) (1.56 g/plant and 249.60 kg/ha) whereas lowest

Table 1. Effect of growing media on the performance of *Picrorhiza kurrooa*

Treatment	Sprouting (%)	Survival (%)	Leaf yield (g/plant)		Rootstock yield (g/plant)		Rootstock yield (kg/ha)		Rootstock/shoot ratio	
			2nd yr	3rd yr	2nd yr	3rd yr	2nd yr	3rd yr	2nd yr	3rd yr
T_1	70.00	62.62	0.39	1.71	0.68	4.10	108.80	656.00	1.74	2.40
T_2	72.12	67.14	0.41	1.73	0.69	4.11	110.40	657.60	1.68	2.38
T_3	85.50	76.50	0.59	1.91	1.30	4.72	208.80	755.20	2.20	2.47
T_4	90.00	77.50	0.61	1.93	1.38	4.80	220.80	768.00	2.26	2.49
T_5	92.00	80.86	0.69	2.01	1.56	4.98	249.60	796.80	2.26	2.48
T_6	90.20	82.84	0.68	2.00	1.60	5.02	256.00	803.20	2.35	2.51
$CD_{0.05}$	2.41	2.03	0.10	0.16	0.18	0.24	7.03	13.78	0.11	NS

T_1= soil alone, T_2= soil + sand 2:1, T_3= soil + sand + FYM 2:1:1, T_4= soil + sand + vermicompost 2:1:1
T_5= soil + sand + sheep manure 2:1:1, T_6= soil + sand + humus 2:1:1

(0.68 g/plant and 108.80 kg/ha) in T_1 (soil) following T_2 (soil + sand 2:1) with values of 0.69 g/plant and 4.11kg/ha.

As is evident from the data (Table 1) that after third year of plant growth T_6 (soil + sand + humus 2:1:1) recorded highest rootstock yield (5.02 g/plant and 803.20 kg/ha) followed by T_5 (soil + sand + sheep manure 2:1:1) with values of 4.98 g/plant and 796.80 kg/ha. Treatment T_1 (soil) exhibited lowest (4.10 g/plant and 656.00 kg/ha) yield following T_2 (soil + sand 2:1) with values of 4.11 g/plant and 657.60 kg/ha.

Rootstock/shoot ratio: The data presented in Table 1 reveal that treatment T_6 (soil + sand + humus 2:1:1) exhibited highest (2.35 and 2.51) rootstock/shoot ratio in the second and third year of growth respectively. However lowest (1.68 and 2.38) rootstock/shoot ratio was recorded in T_2 (soil + sand 2:1) followed by T_1 (soil) showing values of 1.74 and 2.40 at the end of second and third year growth respectively.

The role of growing media in inducing rooting in stem cuttings and more so the growth and yield is well known. An ideal growing medium should be able to provide enough moisture and nutrients for root initiation besides preventing the desiccation of the cut ends.

The results of the studies presented in Table 1 reveal that growing media comprising of soil + sand + humus (2:1:1) significantly increased sprouting, survival, leaf and rootstock yield as compared to when only soil was used. Soil + sand + sheep manure (2:1:1) media gave at par results with soil + sand + humus (2:1:1) whereas soil medium gave lowest sprouting, survival, leaf and rootstock yield.

It appears that well decomposed organic matter vis-a-vis enhanced soil microorganisms activities in humus medium and heat produced by sheep manure medium had resulted in more sprouting vis-a-vis survival and hence more yield under the cold climate where the study has been undertaken. Impoverished fertility and low moisture holding capacity of the medium soil alone had resulted in low sprouting, survival as well as yield. Nautiyal et al (2001) has reported higher rootstock yield in both seed and cuttings raised plants of *P kurrooa* by using sandy loam soil and forest litter (1:2) as the medim.

Use of soil, sand, FYM, forest litter, cocopeat, municipal solid waste etc as growing media has been reported in other medicinal plants as well viz *Rauwolfia serpentina* (Generalao 1977) and *P kurrooa* (Mehra 2006).

CONCLUSION

Out of the six growing media tested for growth and yield attributes of *P kurrooa* it was concluded from the studies that soil + sand + humus (2:1:1) was the best medim followed by soil + sand + sheep manure (2:1:1), soil + sand + vermicompost (2:1:1) and soil + sand + FYM (2:1:1). Media soil alone and soil + sand (2:1) gave lowest values for all the parameters under study.

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