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Short Communication

Growth and Biomass of *Salvadora persica* Linn. under Different Nutrition Levels

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Salvadora persica L. (Fam. Salvadoraceae), commonly called Khara Jhal/Pilu, is perennial shrub/tree found in extreme saline as well as water stress conditions of the Indian desert. The tender branches and roots are used as toothbrushes or chewing sticks, known as Meswak. The roots contain 90% Benzylisothiocyanate, a compound responsible for decreasing dental caries (Zodape and Indusekhar, 1997). Leaves possess antisocrbutic and astringent properties. A decoction of leaves is used in asthma and cough and juice of leaves is given in scurvy (Panda, 2000). The dried seeds contain 30 to 40% non-edible oil, which has industrial value (Sen and Chawan, 1969). This oil possesses virucidal activity against Herpes Simplex Virus (HSV), seems to support the use of Meswak as a preventive measure in controlling the oral infection. In view the medicinal importance of the species, the present study was conducted to find out the optimum nutrient requirement for maximum growth and biomass production.

Field experiments were conducted at Experimental field of Botany Department during 1999-2001. The soil was sandy loam in nature with pH ranging from 8.06 to 8.69 and having organic carbon 0.34 to 0.63%, nitrogen 28.6 to 50.1 mg and phosphorus 3.1 to 7.4 mg 100^{-1} g dry soil. *S. persica* seeds were collected from fully grown mature plants during April to May 1999 from Luni (35 km south of University Campus, Jodhpur) and sown in polybags (25 x 10 cm) containing mixture of sand:clay:FYM in 1:2:1 ratio during June 1999. One-month-old seedlings were transplanted from nursery to the experimental field during July 1999 in pits (60 x 60 cm) at a distance of 2 x 2 m in Randomized Block Design. Same soil mixtures were used in pits as in nursery.

The experiment comprized of seven treatments beside control and each treatment had nine replications. The treatments were: AM (arbuscular mycorrhizae, 100 g $plant^{-1}$), FYM (goat manure, 10 t ha^{-1}), Hexameal (an organic manure, 40 q ha^{-1}), NPK (full dose, 60:40:30 kg ha^{-1}), NPK (half dose, 30:20:15 kg ha^{-1}), NPK (full dose) + Hexameal and NPK (half dose) + Hexameal. The treatments were given after 3 months of seedling establishment and repeated after every three months up to one year except for AM, which was given once only. For this treatment, soil containing spores of

Table 1. Effect of different treatments on plant height, collar diameter, biomass and Harvest Index of S. persica under field conditions after 12 and 24 months

Treatments	Plant height (cm)		Collar dia. (cm)		Biomass (g plant^{-1} dry wt.)				Harvest index (%)	
	12	24	12	24	Above ground		Below ground		12	24
					12	24	12	24		
Control	135.6	162.0	2.67	3.66	347.0	735.1	85.0	300.0	19.67	28.98
AM	149.1	207.0	3.71	5.22	942.2	2390.0	230.2	1110.1	19.62	31.71
FYM	144.8	194.4	3.23	5.11	435.2	1835.2	105.0	800.9	19.44	30.36
Hexameal	144.6	195.4	2.99	4.31	353.1	1880.4	85.2	725.4	19.40	27.83
NPK (fd)	141.3	187.2	3.21	5.27	512.2	2190.9	160.5	1070.1	23.80	32.82
NPK (hd)	145.6	193.0	3.17	4.79	706.3	1680.2	172.4	680.2	19.58	28.81
NPK (fd) + Hexa.	137.0	204.8	3.32	4.57	787.0	1390.1	205.2	580.4	20.66	29.44
NPK (hd) + Hexa.	136.1	186.6	3.00	5.07	680.9	895.4	146.1	340.5	17.67	27.53
CD	6.861**	8.679**	0.062**	0.810*	9.340**	30.07**	3.242**	18.12**	2.648*	NS

fd = full dose, hd = half dose, Hexa. = Hexameal, NS = Non-significant, * and ** = Significant at 5 and 1% probability levels, respectively.

genus *Glomus* were collected from underneath the naturally growing *Cenchrus ciliaris* and *C. setigerus*. 100 g soil was mixed with soil mixture in polybags before seed sowing. The treatments of NPK were split into two equal doses. Irrigation was given as and when required. Observations on plant height, collar diameter and biomass yield were recorded after 12 and 24 months of seedling transplantation in the field. For estimation of biomass and harvest index (HI), plants were uprooted and dry weights of above ground and below ground biomass recorded. HI was calculated following Beadle (1993):

HI (%) = Dry weight of economic part (root)/Total dry weight x 100

The experimental data were subjected to analyses of variance as per Gomez and Gomez (1984).

All treatments increased the plant height and collar diameter significantly over control (Table 1). Maximum plant height was observed under AM treatment followed by NPK (full dose + Hexameal) and minimum in control 24 months after transplanting. The collar diameter was maximum in NPK (full dose) treated plants followed by AM and minimum was in control. The aboveground and belowground biomass yields increased significantly under all the treatments over control. These were maximum in AM treatment followed by NPK (full dose) and minimum in control after 24 months of growth. The HI was maximum under NPK (full dose) and minimum with the application of NPK (half dose) + Hexameal treatment. The data were significant at 5 and 1% probability levels for all parameters, except for HI after 24 months.

Arid region soils are poor in available nutrients. AM fungal mycelia helps in colonizing plant root, enhance plant growth and mineral nutrient acquisition, especially for plants grown in soils low in fertility

(Sharma, 2001). It also helps in binding sand particles, leading to stabilization of sand dunes (Clark, 1997). Muthumanickam and Balakrishnamurthy (1999) reported a high dry root yield with the application of NPK in *Withania somnifera*. The present study also confirms the above findings. Among all treatments, inoculation of AM-fungi is found to be the best in increasing the plant height and above and below ground biomass, while NPK (full dose) for collar diameter and HI. Arbuscular mycorrhizae (AM-fungi) act as biofertilizer and lead to faster root and shoot development. The response of NPK applications may be attributed to the better nutrient availability and its favorable effects on physical and biological properties of soil, resulting in increased collar diameter and HI.

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References

Beadle, C.L. 1993. Growth analysis. In *Photosynthesis and Production in Changing Environment: A Field and Laboratory Manual* (Eds. O.D. Hall, J.M.O. Scurlock, H.R. Bolhar-Nordenkampf, R.C. Leegood and S.P. Long), pp. 36-46. Chapman & Hall, London.

Clark, R.B. 1997. Arbuscular mycorrhizal adaptation, spores germination, roots colonization and host plant growth and mineral acquisition at low pH. *Plant and Soil* 192: 23-30.

Gomez, K.A. and Gomez, A.A. 1984. *Statistical Procedure for Agricultural Research* (2nd Ed.) John Wiley & Sons, New York, USA.

Muthumanickam, D. and Balakrishnamurthy, G. 1999. Studies on nutritional requirement for aswagandh (*Withania somnifera* Dunal) in Shevroy hills of Tamil Nadu, India. *Journal of Spices and Aromatic Crops* 8: 179-183.

Panda, H. 2000. *Herbs Cultivation and Medicinal Uses*. National Institute of Industrial Research, New Delhi, pp. 609.

Sen, D.N. and Chawan, D.D. 1969. Search for supplementary useful plants in Indian desert and their ecology. 1. *Salvadora persica* Linn. and *S. oleoides* Druce. *The Indian Forester* 95: 681-688.

Sharma, A.K. 2001. *A Handbook of Organic Farming*. Agrobios (India), Jodhpur, pp. 627.

Zodape, S.T. and Indusekhar, V.K. 1997. *Salvadora persica*, a boon to wasteland development. *Journal of Scientific and Industrial Research* 56: 657-661.