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Effect of Different Altitudinal Locations on the Biomass of *Andrographis Paniculata*

[1]Topal Divya, [2]Kumar Bharat

[1]Department of Botany, Pt.L.M.S.PG. College, Rishikesh 249201, Uttarakhand, India

[2] Uttaranchal College Of Science & Technology, Dehradun, Uttarakhand, India

Abstract: **During the growing seasons of 2007 and 2008, biomass productivity of *Andrographis paniculata* was examined at three nurseries of forest department located at different altitudes (460m, 960 m and 2530 m above mean sea level) in Tehri Garhwal, one of the western most district of Uttarakhand state located on the northern part of India. Organic carbon, potassium, Nitrogen and Phosphorus of soil significantly affected the productivity of the *Andrographis paniculata*. The biomass declined significantly with increasing altitude .Dry and fresh weight of shoot and root was recorded highest at lower altitude whereas least at highest altitude.**

Keywords: ***Andrographis*** **paniculata, Altitude, Organic Carbon(C), Potassium (K), Nitrogen (N), Phosphorus (P).**

I. INTRODUCTION

Ayurveda, the oldest medical system in Indian sub-continent, has alone reported approximately 2000 medicinal plant species, followed by Siddha and Unani .The Charak Samhita, an age-old written document on herbal therapy, reports on the production of 340 herbal drugs and their indigenous uses (Prajapati *et al*., 2003). The Sushruta Samhita attributed to Sushruta in the 6th Century B.C describes 700 medicinal plants,64 preparations from mineral sources and 57 preparations based on animal sources (Dwivedi *et al*., 2007). Avicenna's The Canon of Medicine (1025) is considered the first pharmacopoeia (Philip, 1992 and Idrisi, 2005) and list 800 tested drugs, plants and minerals. Kalmegh (Andrographis paniculata) *Andrographis paniculata* a herbaceous plant belonging to the family of Acanthaceae is used in traditional Siddha and Ayurvedic systems of medicine as well as in tribal medicine in India and some other countries for multiple clinical applications. Kalmegh is known for its exceptional ability to protect the liver, brain and heart; the 3 major organs of the body that embodify the body, heart, spirit complex of shaman ritualistic medicine. A. paniculata is an erect annual herb native to India, China, and Southeast Asia. The square stem has wings on the angles of new growth and is enlarged at the nodes, while the small flowers are borne on a spreading panicle. It is widely cultivated in Asia. Present research work deals with effect of different altitudinal locations and treatments i.e. vermicompost, bio compost and farmyard manure on the biomass of *Andrographis paniculata.*

II. MATERIAL AND METHODS

Tehri Garhwal, one of the western most district of Uttarakhand state is located on the northern part of India. The district lies between the parallels of 30.3'and 30.53'north latitude and 77.56'and 79.04'east longitude. Biomass of *Andrographis paniculata* was studied along an altitudinal gradient during 2007 and 2008 in Tehri Garhwal . The study was done at three nurseries of forest department located at different altitudes viz. 460m (Dr. Susheela Tiwari herbal garden muni-ki-reti), 960 m (Dhaulapani, Narendra nagar) and 2530 m(Kaddukhal)above mean sea level of the district. The different chemical properties of the soil were observed for the respective sites at the depth of 0-10 cm, 10-20cm and 20-30 cm. The organic carbon present in soil was determined by Walkley and Black's Rapid Titration method. Available potassium was determined by Jackson method (Muhr and Datta *et al.,* 1965). Nitrogen was determined by Kjeldahl's digestion and distillation method. The seeds were collected from Dr. Susheela Tiwari Herbal Garden, Muni-ki-reti, Rishikesh. Seeds were sown in the month of May in four poly bags filled with soil and three different treatments i.e. vermicompost, bio

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compost, farmyard manure, each in ratio of 1:2 and one was control at three different selected sites (Site 1- Herbal garden, Site 2-Dhaulapani, Site 3- Kaddukhal). After 10 -15 days of seed germination , the polythene bags were removed and planted in the main field at spacing of 15x15 cm in respective beds of 3x1.5 m size at different experimental sites. Three samples were taken after eight months and data was recorded for fresh and dry weight of root and shoot. The data was analyzed as factorial analysis using GENSTAT 5 Statistical Package.

III. RESULTS AND DISCUSSION

The value of organic carbon was highest for site I ,than for site II and site III at all level of depth (Table 1).The percentage of nitrogen was maximum on site I at all levels of depth (0.12%, 0.12 % and 0.11 %). The highest values of phosphorus and potassium were also recorded from site I at all level of depth. Site III recorded the least values of phosphorus and potassium (Table 1). The wide variation was detected among sites for root fresh weight. Maximum fresh weight of root was analysed in site I as compared to other sites (Table 2). The shoot fresh weight of *Andrographis paniculata* showed that variations among sites were highly significant .The shoot fresh weight was found maximum in site I and minimum in site III. The average root dry weight of the plant was found to be high in site I than in site II and Site III with highly significant variations. The analysis of shoot dry weight indicated that variations among sites were significant. The shoot dry weight reported with their highest value in site I than other sites (Table 2). The effect of interaction between site and treatment was found to be non-significant for all the growth parameters, although vermicompost application at site I recorded highest value among other interactions (Table 3).

The difference in weight in three sites may be due to the difference in nutrient level present in soil of the respective sites. The table (1) shows that the amount of phosphorus and potassium was greater in site I which is responsible for the maximum yield as compared to site II which gave better fresh weight than site III . Nitrogen is the most important inorganic nutrient in plants and major constituents of proteins, nucleic acids, many cofactors and secondary metabolites (Marschner, 1995). P supply can modulate the content of activated RUBISCO either directly or indirectly (Usuda and Shimogawara, 1991; Rao and Terry, 1995; Pieters *et al*., 2001) and influencing photosynthetic activity of plant. Wissuwa *et al*., (1998) reported in their study that deficiency of phosphorus in the soil has reduced the yield of rice. It has been studied that potassium in different forms influenced the plant yield and its chlorophyll contents (Chapagain and Wiesman, 2004). Xue *et al*. (1992) also revealed that the higher dose of phosphorus favoured the high yield of asparagus. Sale and Campbell (1986) reported that potassium deficient soils are likely to produce crops with low yields in soybeans.

Table 1: Chemical properties of soil

Element (%)	Depth (cm)	HG	DH	KH
Organic Carbon	0-10 10-20 20-30	1.22 0.99 0.95	0.62 0.62 0.61	0.50 0.48 0.43
Nitrogen	0-10 10-20 20-30	0.12 0.12 0.11	0.06 0.06 0.05	0.05 0.04 0.04
Phosphorus	0-10 10-20 20-30	0.0052 0.0050 0.0049	0.0034 0.0032 0.0030	0.0020 0.0020 0.0018
Potassium	0-10 10-20 20-30	0.0222 0.0220 0.0219	0.0195 0.0189 0.0185	0.0135 0.0131 0.0128

HG: Herbal Garden**, DH:** Dhaulapani**, KH:** Kaddukhal

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Table 2: Effect of site at different altitude on growth parameters of *Andrographis paniculata* after eight months

		Root fresh weight (gm)	Shoot fresh weight (gm)	Root dry weight (gm)	Shoot dry weight (gm)
SITE	**I-HG**	0.36(0.04)	1.35(0.30)	0.14(0.02)	0.731(0.14)
	II-DH	0.23(0.03)	0.69(0.09)	0.11(0.02)	0.43(0.06)
	III-KH	0.15(0.02)	0.49(0.08)	0.07(0.01)	0.29(0.06)
	C.D at 5%	0.08	0.20	0.05	0.15

Note: The values given in parenthesis are the standard error of mean values.

C.D- Critical difference, **NS** – Non-Significant

HG- Herbal garden, **DH**-Dhaulapani, **KH**- Kaddukhal

Table 3: Effect of interaction between treatment and site at different altitude on growth parameters of *Andrographis paniculata* after eight months

		Root fresh weight (gm)	Shoot fresh weight (gm)	Root dry weight (gm)	Shoot dry weight (gm)
SITE I (HG)	**Bio compost**	**0.28(0.06)**	**1.10(0.15)**	**0.12(0.04)**	**0.57(0.09)**
	Farmyard manure	**0.35(0.04)**	**1.29(0.32)**	**0.16(0.04)**	**0.80(0.21)**
	Vermicompost	**0.57(0.07)**	**2.15(1.15)**	**0.21(0.04)**	**1.15(0.46)**
	Control	**0.23(0.02)**	**0.88(0.06)**	**0.08(0.03)**	**0.40(0.16)**
II SITE (DH)	**Bio compost**	**0.19(0.08)**	**0.60(0.04)**	**0.08(0.05)**	**0.31(0.03)**
	Farmyard manure	**0.23(0.09)**	**0.71(0.07)**	**0.13(0.05)**	**0.51(0.07)**
	Vermicompost	**0.32(0.04)**	**1.09(0.16)**	**0.16(0.04)**	**0.69(0.09)**
	Control	**0.16(0.03)**	**0.37(0.05)**	**0.07(0.01)**	**0.21(0.01)**
SITE III(KH)	**Bio compost**	**0.08(0.03)**	**0.41(0.11)**	**0.05(0.01)**	**0.23(0.05)**
	Farmyard manure	**0.18(0.06)**	**0.49(0.25)**	**0.07(0.01)**	**0.32(0.19)**
	Vermicompost	**0.26(0.04)**	**0.77(0.05)**	**0.12(0.03)**	**0.46(0.07)**
	Control	**0.06(0.01)**	**0.28(0.06)**	**0.03(0.01)**	**0.18(0.04)**
	C.D at 5%	**NS**	**NS**	**NS**	**NS**

Note: The values given in parenthesis are the standard error of mean values.

C.D- Critical difference, **NS –** Non-Significant

HG- Herbal garden, **DH**-Dhaulapani, **KH**- Kaddukhal

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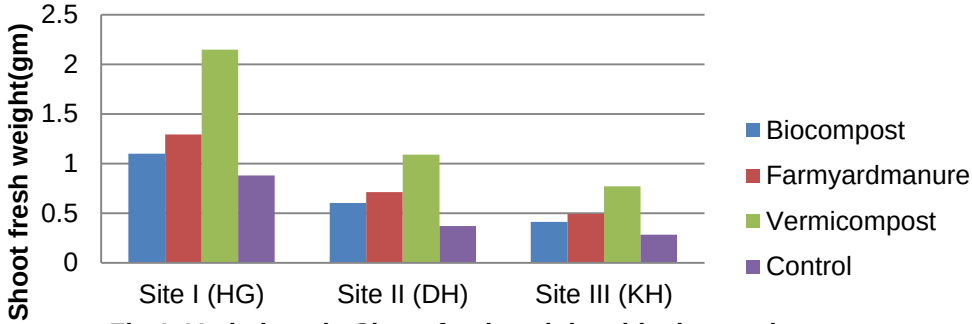

Fig.1 Variations in Shoot fresh weight with sites and treatments after eight months

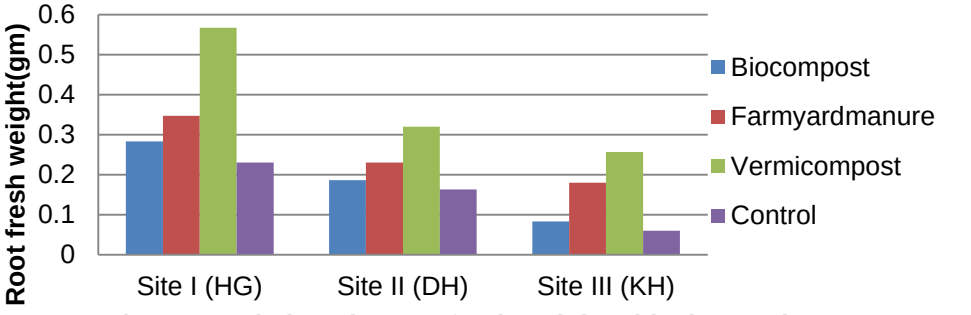

Fig.2.0 Variations in Root fresh weight with sites and treatments after eight months

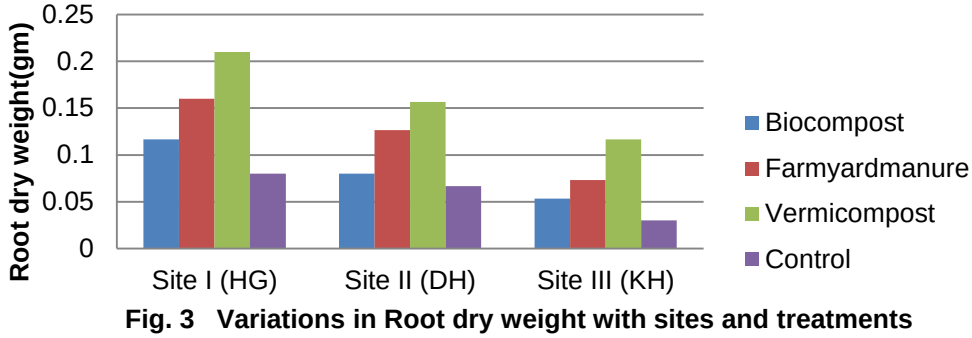

Fig. 3 Variations in Root dry weight with sites and treatments after eight months

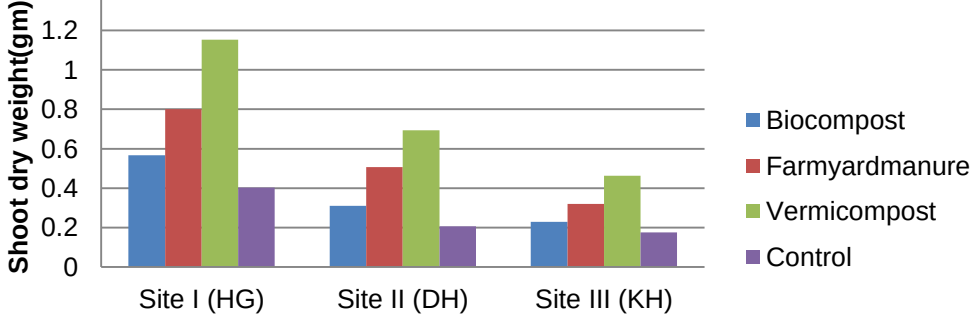

Fig. 4 Variations in Shoot dry weight with sites and treatments after eight months

IV. CONCLUSION

The present study thus concluded that the lower altitude is best suited for the cultivation of *Andrographis paniculata* .This study will help large scale growers for the commercial cultivation of *Andrographis* and other crops.

REFERENCES

[1] Chapagain B.P.and Wiesman Z. (2004). Effect of potassium, magnesium, chloride in the fertigation solution as partial source of potassium on growth, yield and quantity of greenhouse tomato. Scientia. Hortic. 99: 279-288

[2] Dwivedi G. and Dwivedi S. (2007) .History of Medicine :Sushruta-the Clinician –Teacher par Excellence .National Informatics Centre.

[3] Idrisi Z. (2005) .The Muslim Agricultural Revolution and its influence on Europe. The Foundation for Science, Technology and Civilization, U.K.

[4] Marschner M. (1995). Mineral Nutrition of Higher Plants. 2nd Edn., Academic Press, London and New York, ISBN-10: 0124735436, pp: 200-255.

[5] Muhr G.R., Datta N.P., Sankarsubramoney H.,Leley V.K. and Donahue R.l.(1965).Soil testing in U.S.A.I.D .Mission to India ,New Delhi.

[6] Prajapati N.D., Purohit S.S., Sharma A.K.and Kumar T. (2003): A Handbook of Medicinal Plants . Jodhpur: Agrobios.

[7] Philip k. Hitti and Ajram K. (1992). Miracle of Islamic Science.Appendix B, Knowledge House Publishers.

[8] Pieters A., Paul M.J. and Lawlor D.W. (2001). Low sink demand limits photosynthesis under P deficiency. J. Exp. Bot. 52: 1083-1091.

[9] Rao I.M. and Terry N. (1995). Leaf phosphate status, photosynthesis and carbon partitioning in sugar beet IV. Changes with time following increased supply of phosphate to low-phosphate plants. Plant Physiol. 107: 1313-1321.

[10] Sale P. W. G. and Campbell L. C. (1986). Yield and composition of soybean seed as a function of potassium supply. Plant and Soil 96(3): 317-325

[11] Wissuwa M., Yano M. and Ae N. (1998). Mapping of QTLs for phosphorus-deficiency tolerance in rice (Oryza sativa L.). Theor. Appl. Genet. 97: 777-783.

[12] Xue X., Shen L. and Jin Y. (1992). Effects of fertilization on yield of Asparagus cochinchinensis (Lour.). Zhongguo Zhong Yao Za Hi 17: 464-465.