

Effect of Integrated Nutrient Management on andrographolide content of *Andrographis paniculata*.¹Sushma Mishra, ²Dr. Aruna Jain¹Research Scholar, ²Asst. Prof. Botany
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Abstract: The present investigation was conducted to study the effect of chemical fertilizers and biofertilizers combination along with vermicompost on andrographolide content of *Andrographis paniculata*. The experiment was laid out in a randomized block design (RDB) with 8 treatments using chemical fertilizers (NPK), vermicompost and biofertilizers (*Azotobacter* and *Phosphate Solubilising Bacteria*) in different combinations including one control treatment. The analysis revealed significant variation in andrographolide content at different stages of life cycle of plant. After 45DAS, 75DAS, 105DAS and 135DAS, maximum increased % andrographolide was observed 0.749%, 0.764%, 0.834%, 0.893% in T₈ plot plants treated with BF+CF+VC in combination in an interval of 30 days. From these results it can be concluded that integrated nutrient treatment facilitate increase % andrographolide content in *A. paniculata*. Thus INM can be an alternative to chemical fertilizers for sustainable quality crops.

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Keywords - Biofertilizers, Chemical fertilizers, Vermicompost, INM, Andrographolide, DAS(days after sowing).

Introduction

India has a wide biodiversity of medicinal plants that grow in forest and uncultivated areas. In present scenario of world trade organization and globalization, the demand of medicinal plants has increased many folds. Kalmegh (*Andrographis paniculata*) is an important medicinal plant of family Acanthaceae being used in Indian system of medicines since time immemorial. The plant is also known as rice bitters in West Indies and king of bitters or chiretta in England. The primary medicinal constituents of *Andrographis paniculata* are andrographolide content showing antimalarial (Mishra P. *et al* 1992), anti-diarrhoeal (Gupta S. *et al* 1993), hepatoprotective (Handa S.S. *et al* 1990), anti-inflammatory (Shen Y.C. *et al* 2002) activities. Fertilizer management in integrated manner has beneficial effect on soil fertility and available plant nutrients resulting in sustainable crop production and quality.

Keeping this in view, an investigation was carried out to study the effect of integrated supply of nutrients through organic manure such as vermicompost, biofertilizers, (*Azotobacter*, Phosphate Solubilizing Bacteria) and inorganic sources of macronutrients (NPK) on andrographolide of *Andrographis paniculata*.

Material and Methods

The present study was carried out during kharif season of 2010-11 at Sarojini Naidu Govt. Girls P.G. College, Bhopal, M. P. The soil of the experimental plots was sandy loam texture. The experiment was conducted in a randomized block design (RBD) with 8 treatment using chemical fertilizers (NPK),

vermicompost, and biofertilizers (*Azotobacter*, phosphate solubilizing bacteria) in different combinations including one control treatment. The treatments were T₁ - control (no treatment), T₂ - Vermicompost 5t ha⁻¹, T₃ - Biofertilizers (250g *Azotobacter* ha⁻¹ + 250g PSB ha⁻¹), T₄ - Chemical fertilizers (60:30:30kg NPK ha⁻¹), T₅-BF + VC (125g *Azotobacter* + 125g PSB + 5t vermicompost ha⁻¹), T₆-BF + CF [125g *Azotobacter* + 125g PSB + 50% NPK (RDF) ha⁻¹], T₇ - CF + VC (50% NPK + 5t vermicompost ha⁻¹) and T₈ - BF + CF + VC [250g biofertilizers (125g *Azotobacter* + 125g PSB) + 50% NPK (RDF) + 5t vermicompost ha⁻¹].

Estimation of Andrographolide

Andrographolide content in plant sample were analysed as per method by Jain *et al.*, (2000). A composite sample of 5 plants was collected from T₁-T₈ plots. Then 1.0g air dried (50°C for 24h) and powdered plant material were extracted using methanol (3 × 10mL, 12h at room temperature 25°C), filtered and the extract was concentrated under vacuum till dryness and a known amount was subjected to HPLC analysis and percent content of andrographolide were estimated by the area count of andrographolide peak in each sample.

Statistical Analysis

Analysis of observation taken on different variable was carried out to know the degree of variation among all the treatments. The results were obtained through analysis of variance (ANOVA) and SPSS software- version 20, 2011.

Result and Discussion

Average value of % andrographolide in per gm sample of *Andrographis paniculata*.

Plot no.	Treatments	45DAS	75DAS	105DAS	135DAS
T ₁	NT	0.683	0.710	0.724	0.739
T ₂	VC	0.751	0.762	0.778	0.793
T ₃	BF	0.743	0.749	0.762	0.776
T ₄	CF	0.742	0.748	0.751	0.758
T ₅	BF + VC	0.752	0.763	0.841	0.831
T ₆	BF + CF	0.698	0.742	0.743	0.748
T ₇	C F+ VC	0.741	0.743	0.745	0.749
T ₈	BF + CF + VC	0.749	0.764	0.834	0.893
SA	mean	0.7324	0.7476	0.7689	0.7859
SA	SD	0.02648	0.01765	0.03776	0.05268
SA	SEm	0.00936	0.00624	0.01335	0.01863
(SA) 95% confidence interval of the difference	(Lower)	0.7102	0.7329	0.7373	0.7418
	(upper)	0.7545	0.7624	0.8004	0.8299

Abbreviations:- NT- no treatment, BF-biofertilizers, CF- chemical fertilizers, VC- vermicompost, SD- standard deviation, SEm- standard error mean, SA-Statistical Analysis

The analysis of andrographolide content of *Andrographis paniculata* showed significant variation at vegetative to harvesting stage in different treatments. After 45 DAS, the maximum percentage of andrographolide content was recorded as 0.749% in T₈ treatments followed by 0.752% in T₅, 0.751% in T₂, 0.743% in T₃, 0.742% in T₄, 0.741% in T₇, 0.698 in T₆ and least andrographolide content was 0.683% in T₁ treatment. After 75 DAS, the maximum percentage of andrographolide content was 0.764% in T₈ treatments followed by 0.763% in T₅, 0.762% in T₂, 0.749% in T₃, 0.748% in T₄, 0.743% in T₇, 0.742 in T₆ and least andrographolide content was 0.710% in T₁ treatment. After 105DAS, the maximum percentage of andrographolide content was 0.841% in T₈ treatments followed by 0.841% in T₅, 0.778% in T₂, 0.762% in T₃, 0.751% in T₄, 0.745% in T₇, 0.743 in T₆ and least andrographolide content was 0.724% in T₁ treatment. At harvest stage i.e 135 DAS, the maximum percentage of andrographolide content was 0.893% in T₈ treatment followed by 0.831% in T₅, 0.793% in T₂, 0.776% in T₃, 0.758% in T₄, 0.749% in T₇, 0.748% in T₆ and least andrographolide content was 0.739% in T₁ treatment.

From the above results it can be concluded that the application of biofertilizers, chemical fertilizers along with vermicompost was effective to increase

percent andrographolide content under these treatments. Present study reveals that application of biofertilizers, chemical fertilizers and vermicompost in combination play a vital role in maximizing the andrographolide content in this plant.

Thus it is clear that the integrated nutrient management (BF +CF + VC) shows best results than other treatments or no treatment. Similar findings was observed by Sanjutha et al., 2008 and Ramesh et al., 2011 in *A. paniculata*. Overall, it can be concluded that integrated nutrient management is the best technique to increase percent of andrographolide in *Andrographis paniculata*.

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