



IMPACT OF BIOFERTILIZERS, CHEMICAL FERTILIZERS AND VERMICOMPOST ON SEED QUALITY ATTRIBUTES OF *A. paniculata*

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ABSTRACT

Andrographis paniculata (Kalmegh) is an annual medicinal herb, being effectively used in treating a variety of illnesses. The experiment was conducted in a randomized block design (RBD) with 8 treatments *i.e.* T₁-NT, T₂- VC, T₃-BF, T₄-CF, T₅-BF+VC, T₆-BF+CF, T₇ . CF + VC, T₈-BF+CF+VC. The analysis revealed significant increase in seed quality attributes 20 DAS of plant. Maximum increased % germination was 90%, root length of seedlings was 1.8 cm, shoot length of seedlings was 2.56 cm and seedling vigour index was 392.4 in T₈ plot plants treated with BF+CF+VC in combination. From these results it can be concluded that integrated nutrient treatment facilitate increased seed quality attributes of *A. paniculata*, thus, can be an alternative to chemical fertilizers.

KEYWORDS: Biofertilizers, Chemical fertilizers, Vermicompost, INM, SVI, DAS (days after sowing).

INTRODUCTION

Kalmegh is an annual herb. It is the plant of vegetable category. Its botanical name is *Andrographis paniculata* and also known as kalmegh in hindi. It is also reported from China, Java, Malaysia, Bangladesh, India. It belongs to the family Acanthaceae. It is a medicinal herb, effectively used in treating a variety of illnesses. Numerous pharmacological activities of the *Andrographis paniculata* have been reported including antidiarrhoeal (Gupta *et al.*, 1993), antiviral (Wiert *et al.*, 2005), antimalarial (Mishra P *et al.*, 1992), anticancers (Kumar RA *et al.*, 2004), anti-HIV (Calabrese *et al.*, 2000), anti-diabetic activity (Lal J., 1986) hepatoprotective activity (Handa *et al.*, 1990) *etc.* It whole plant has medicinal uses. The entire plant to used for its therapeutic properties and medicinal products made of them are frequently taken to improve health as dietary supplements.

MATERIAL AND METHODS

The field experiment was conducted at Sarojini Naidu Govt. Girls P.G. (Autonomous) college, Bhopal of Madhya Pradesh. 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 VC. For recording various biometric observations, five plants were randomly selected from sampling, and tagged for recording Seed quality attributes.

Percentage Germination

% Germination was worked out at 15 DAS. It was calculated by using the formula (Kopped *et al.*, 2006).

$$\% G = \frac{\text{Total no. of seed emerged (Gn)}}{\text{Total no. of sowing seed (Nn)}} \times 100$$

Root - Shoot length

Five seedlings were chosen at final count of germination to measure root-shoot length. The root length was measured from tip to primary root to base of hypocotyls and mean root length was expressed in centimeters. The shoot length measured from collar region to base of the tip and mean shoot length was recorded in centimeters.

Seedling vigour Index (SVI)

The vigour index of seedling was calculated by adopting the method suggested by Abdul- Baki and Anderson (1973) and was expressed in whole number by using the formula:- SVI = G% × (R.L+S.L)

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.

RESULTS

TABLE 1. Effect of INM on SVI index of *A. paniculata* at 20 DAS

| Plot No. | Treatment | G% | RL. (cm) | S.L.(cm) | SVI = G% × (SL+RL) |
|------------------------------------------|-----------|----------|----------|----------|--------------------|
| T1 | NT | 58 | 0.6 | 0.88 | 85.84 |
| T2 | VC | 84 | 1.48 | 2.28 | 300.8 |
| T3 | BF | 80 | 1.2 | 2.16 | 282.24 |
| T4 | CF | 78 | 1.04 | 2.12 | 246.48 |
| T5 | BF+VC | 88 | 1.7 | 2.38 | 359.04 |
| T6 | BF+CF | 72 | 0.62 | 1.94 | 184.32 |
| T7 | CF+VC | 76 | 0.64 | 2.08 | 206.72 |
| T8 | BF+CF+VC | 90 | 1.8 | 2.56 | 392.4 |
| SA | mean | 78.2500 | 1.1350 | 2.0500 | 257.2300 |
| SA | SD | 10.16647 | 0.49138 | 0.51001 | 98.93524 |
| SA | SEm | 3.59439 | 0.17373 | 0.18032 | 34.97889 |
| (SA) 95% | Lower | 69.7506 | 0.7242 | 1.5458 | 2.4764 |
| confidence interval of the difference | Upper | 86.7494 | 174.5181 | 339.9419 | 339.9419 |

Abbreviations:- NT- no treatment, BF-biofertilizers, CF- chemical fertilizers, VC- vermicompost, SD- standard deviation, SEm- standard error mean, SA-Statistical Analysis, SVI- Seedling Vigour Index, R.L.-Root length, S.L.-Shoot length, % G-Percent germination.

Maximum seedling emergence after 15DAS was 90% in T8 plot followed by 88% in T5 plot, 84% in T2, 80% in T3, 78% in T4, 76% in T7, 72% in T6, plots and least emergence was 58% in T1 plot. Maximum root length of seedlings after 20 DAS was 1.8 cm. in T8 plot followed by 1.7 in T5 plot, 1.48 in T2, 1.2 in T3, 1.04 in T4, 0.64 in T7, 0.62 in T6, plots and least was 0.6 in T1 plot and maximum shoot length of seedlings was 2.5 cm in T8 plot followed by 2.38 in T5 plot, 2.28 in T2, 2.16 in T3, 2.12 in T4, 2.08 in T7, 1.94 in T6, plots and least was 0.88 in T1 plot. Seedling Vigour Index always depends on root-shoot length and percent germination of seedlings. Maximum SVI of seedlings after 20 DAS was 392.4 in T8 plot followed by 359.4 in T5 plot, 300.8 in T2, 282.24 in T3, 246.48 in T4, 206.72 in T7, 184.32 in T6 plots and least SVI was 85.84 in T1 plot.

DISCUSSION

Maximum % germination was 90%, root length of seedlings 1.8cm, shoot length of seedlings 2.56cm, SVI 392.4 was recorded in T8 plot, which was treated with BF, CF and VC in combination. Integrated use of different fertilizers and compost showed significant increase in % germination, root-shoot length of seedlings and SVI compared to non-treated plants. It has already been reported by Assiouty and Sedera (2005) in Spinach; Shashidhara (2000) in Chilli; Firuzsalari *et al.* (2012) in Corn. The result showed that a integrated use of BF, CF and VC treatments significantly increased seed quality attributes of *A. Paniculata*, compared with non-treated plants.

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