Study on Morpho-Physiological Traits in Isabgol (Plantago ovata Forsk.) Influenced by Different Fertilizer Levels

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Abstract

A field experiment entitled Morphophysiological analysis of growth and yield of Isabgol (Plantago ovata Forsk) as influenced by fertilizer levels was conducted at Dhanwantari farm, Department of Botany, Central Campus, MPKV, Rahuri, Dist. Ahmednagar (MS) during rabi season of 2006 – 07. An experiment was laid out in a factorial randomized block design (FRBD) with four replications. In this experiment three varieties (V1:GI-1, V2:HI-5 and V3:Niharika) with two fertilizer levels (L1:50:25:00, L2 : 100: 50: 00 NPK kg/ha) were used. The observations on different morphological characters viz., Growth studies, dry matter studies, days required for different growth stages, yield attributes and yield along with the nutrient uptake was recorded. The studies revealed that among the three genotypes, variety Niharika responded well to fertilizer level resulting in significant increase in growth, yield contributing characters and yield of the crop. Further it was found that application of fertilizer dose of 100:25 NP kg/ha recorded numerically higher values for growth, yield and quality characters and it was statistically found at par with 50:25 NP kg/ha fertilizer dose. Therefore, the application of 50 :25 NP kg/ha dose to Niharika genotype would result to achieve higher isabgol yield rather than 100:25 NP kg/ha dose.

Keywords
Varieties, Fertilizer, Isabgol and Yield

Introduction

Isabgol (Plantago ovata Forsk 2 n = 2x = 8) commercially known as bland Psyllium is one of the most important medicinal plant with commercial value. It belong to ‘Plantaginaceae’ family, This family consist of three genera viz. Bourgeria (Decne), Littarella (Bergivs) and Plantago (L) and about 200 species which are either annual or perennial herb. The name isabgol is derived from two Persian word ‘isap’ and ‘ghol’ meaning horse ear, referring to characteristic shape of it’s seed. It is herbaceous plant generally known as autumn sown annual. Plant height ranging from 40-45 cm and
Materials and Methods

The field experiment was conducted to study "Morpho physiological analysis of growth and yield of Isabgol (Plantago ovata Forsk.) as influenced by fertilizer levels". The details of material used and the method employed in conducting the research experiment are. The experiment was conducted during the rabi season 2006-07 at Scheme for Medicinal and Aromatic Plants, Department of Botany, MPKV, Rahuri-413722, District Ahmednagar (M.S.) (19°47' N, 74°81' E, 657.19 above M.S.L.). The average maximum and minimum temperature were 35.8°C and 9.2°C respectively. The average relative humidity at 7.30 hrs. (RH I) 71.48 % and 14.30 hrs. (RH II) were 30.92 %. The experiment was conducted in the Randomized Block Design with six treatments replicated four times. The gross plot size was 3.60 x 3 m². The allocation of six treatments in four replications along with their symbols used are T₁-GI-1 (50 N, 25 P kg ha⁻¹ dose), T₂-GI-1 (100N, 50 P kg ha⁻¹ dose), T₃-HI-5 (50 N, 25 P kg ha⁻¹ dose), T₄-HI-5 (100 N, 50 P kg ha⁻¹ dose), T₅-Niharika (50 N, 25 P kg ha⁻¹ dose), T₆-Niharika (100 N, 50 P kg ha⁻¹ dose).

Results and Discussion

A field trial to study the “Morphophysiological analysis of growth and yield of Isabgol (Plantago ovata Forsk.) as influenced by fertilizer levels” was conducted during Rabi 2006-07. Fertilizers have pronounced effect on yield contributing characters and yield of isabgol and development of crop throughout the growing season. The yield is dependent on soil fertility, fertilizers applied and varieties used. The higher yield is the combination of several morphological, physiological and environmental factors. A comparison between different treatments in respect of yield revealed that yield increases numerically with fertilizer levels. However, both are at par with each other.

The yield contributing characters viz., seed weight, 1000 seed weight, highest husk yield plant⁻¹ found to be highest in genotype V₃ Niharika while lowest in V₁ GI-1 genotype. The seed yield per plot and per hectare, highest biomass production were recorded significantly highest by genotype V₃ (Niharika) while The genotype V₂ (HI-5) recorded significantly the highest harvest index while the genotype V₁ (GI-1) recorded significantly lowest harvest index. Thus, in general, by increasing the fertilizer level, their was liner increase in yield, Similar result reported by Randhawa et al., (1978). They found that highest seed yield Of Isabgol with nitrogen application @20 or 40 kg ha⁻¹. Solanki and Shaktawat (1999) also found that 45 kg N ha⁻¹ Significantly increased seed yield over control. Further Bist et al., (2001), Rathore and Chandawat (2003) and Utgikar et al., (2003) reported same results. The variety V₃ (Niharika) produced more yield than varieties V₂ (HI-5) and V₁ (GI-1). Response of all these Varieties to the fertilizer treatment was almost similar due to Which the interaction effects were not significant.
Sharma et al., (2003) noted that seed yield and straw yield were significantly higher up to the application of 45 kg N ha\(^{-1}\).

**Table.1** Effect of different fertilizer levels on seed weight per spike, 1000 seed weight (g) and husk yield per plant

| Treatment          | Seed weight per spike (g) | 1000 seed weight (g) | Husk yield per plant (g) |
|--------------------|---------------------------|----------------------|-------------------------|
| **Varieties**      |                           |                      |                         |
| V\(_1\): GI-1      | 0.17                      | 1.77                 | 0.70                    |
| V\(_2\): HI-5      | 0.17                      | 1.82                 | 0.71                    |
| V\(_3\): Niharika  | 0.18                      | 1.82                 | 0.76                    |
| S.E ±              | 0.002                     | 0.008                | 0.003                   |
| CD at 5%           | 0.005                     | 0.025                | 0.009                   |
| **Fertilizer dose (Kg. ha\(^{-1}\))** |                           |                      |                         |
| L\(_1\): 50:25 NP  | 0.173                     | 1.77                 | 0.72                    |
| L\(_2\): 100:50 NP | 0.177                     | 1.83                 | 0.73                    |
| S.E ±              | 0.001                     | 0.013                | 0.053                   |
| CD at 5%           | N.S                       | N.S                  | N.S                     |
| **Interaction (AxB)** |                           |                      |                         |
| S.E ±              | 0.002                     | 0.012                | 0.008                   |
| CD at 5%           | N.S                       | N.S                  | N.S                     |

**Table.2** Effect of different fertilizer levels on seed yield plot\(^{-1}\), seed yield ha\(^{-1}\), total biomass kg ha\(^{-1}\), harvest index and swelling factor

| Treatment          | Seed yield per plot (g) | Seed yield (kg ha\(^{-1}\)) | Total Biomass (kg ha\(^{-1}\)) | Harvest index (%) | Swelling Factor |
|--------------------|-------------------------|-----------------------------|-------------------------------|-------------------|-----------------|
| **Varieties**      |                         |                             |                               |                   |                 |
| V\(_1\): GI-1      | 467.52                  | 541.11                      | 1484.5                        | 36.45             | 10.92           |
| V\(_2\): HI-5      | 464.29                  | 537.37                      | 1314.46                       | 40.88             | 10.96           |
| V\(_3\): Niharika  | 610.13                  | 706.16                      | 1806.6                        | 39.08             | 10.87           |
| S.E ±              | 6.214                   | 6.949                       | 8.634                         | 0.700             | 0.082           |
| CD at 5%           | 18.724                  | 20.614                      | 26.018                        | 2.120             | N.S.            |
| **Fertilizer dose(Kg. ha\(^{-1}\))** |                         |                             |                               |                   |                 |
| L\(_1\): 50:25 NP  | 547.51                  | 633.07                      | 1523.36                       | 41.55             | 11.63           |
| L\(_2\): 100:50 NP | 564.38                  | 653.22                      | 1557.36                       | 41.94             | 10.20           |
| S.E ±              | 11.074                  | 7.674                       | 7.050                         | 1.198             | 0.31            |
| **Interaction (A x B)** |                         |                             |                               |                   |                 |
| S.E ±              | 8.788                   | 14.828                      | 12.211                        | 2.075             | 0.116           |
| CD at 5%           | N.S.                    | N.S.                        | N.S.                          | N.S.              | N.S.            |
Plate 1. Isabgol plant

Plate 2. Seeds of isabgol
Singh and Chouhan (1994) concluded that with increasing levels of N and P$_2$O$_5$ upto 60 kg N + 30 kg P$_2$O$_5$ ha$^{-1}$ significantly increased spikes plant$^{-1}$, 1000 seed weight and seed
yield. Rathore and Chandawat (2003) reported that significant increase in seed and husk yield were recorded with increase in N from 0 to 30 kg ha\(^{-1}\). Sharma \textit{et al.}, (2003) revealed that application of 45 kg N ha\(^{-1}\) increased significantly seed weight plant\(^{-1}\). Niharika recorded highest grain yield and 1000 grain weight. Among the three genotypes, variety V\(_3\) (Niharika) responded well to fertilizer level resulting in significant increase in growth and yield contributing characters. Fertilizer dose 100:25 NP kg ha\(^{-1}\) increased yield contributing characters and yield but, at par with 50:25 NP kg ha\(^{-1}\) fertilizer dose.

Recorded data numerically higher but statistically non-significant. Therefore, application of 50:25 NP kg ha\(^{-1}\) dose may be useful for increase the yield contributing characters and yield of isabgol. The combination of V\(_3\) (Niharika) variety and 50:25 NP kg ha\(^{-1}\) dose significantly increased all the growth and yield characters. It would be, therefore, advisable apply 50:25 NP kg ha\(^{-1}\) dose to Niharika genotype.

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