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

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A B S T R A C T

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, V_2:HI-5 and V_3:Niharika) with two fertilizer levels (L_1 :50:25:00, L_2 : 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.

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. Bourgueria (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

highly cross – pollinated crop and important part is husk and seed. Among species belonging to genus *Plantago* only two species *P. ovata F.* (bland psyllium or isabgol) and *P. psyllium* linn. (French psyllium) are economically important. Important part of isabgol is mucilage which is polysaccharide coating on seed. The separated husk is popularly known as 'Sat isabgol' in Indian market. It is used as medicine for intestinal and stomach disorder. It absorb moisture and form tasteless mucilaginous jelly. Jelly induces intestinal peristalsis for easy ejection and therefore useful in constipation. Refined husk is used in food industry, for manufacturing sausages, ice-creams and sauces.

Materials and Methods

The field experiment was conducted to study "Morpho physiological analysis of growth and yield of isabgol 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, $74^0$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 m^2. The allocation of six treatments in four replications along with their symbols used are T_1-GI-1 (50 N, 25 P kg ha^{-1} dose), T_2-GI-1 (100N, 50 P kg ha^{-1} dose), T_3-HI-5 (50 N, 25 P kg ha^{-1} dose), T_4-HI-5 (100 N, 50 P kg ha^{-1} dose), T_5-Niharika (50 N, 25 P kg ha^{-1} dose), T_6-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 ovate* 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 V_3 Niharika while lowest in V_1 GI-1 genotype. The seed yield per plot and per hectare, highest biomass production were recorded significantly highest by genotype V_3 (Niharika) while The genotype V_2 (HI-5) recorded significantly the highest harvest index while the genotype V_1 (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 V_3 (Niharika) produced more yield than varieties V_2 (HI-5) and V_1 (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

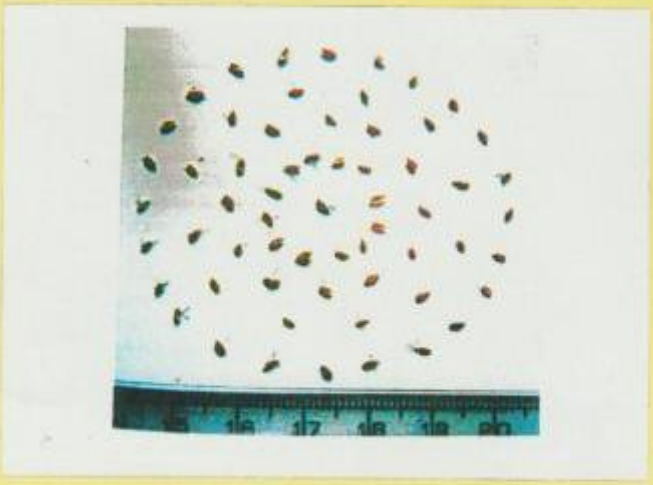

Plate 2. Seeds of isabgol

Plate 6. Treatement
4- Variety HI-5

Plate 7. Treatemen
5- Variety NIHARIKA

Plate 8. Treatement
6- Variety NIHARIKA

Plate 3.Treatement
1- Variety GI-1

Plate 4. Treatement
2- Variety GI-1

Plate 5. Treatement
3- Variety HI-5

Singh and Chouhan (1994) concluded that with increasing levels of N and P_2O_5 upto 60 kg N + 30 kg P_2O_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 *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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