ISSN 2277-8330 (Electronic

*J.Bio.Innov*1(4),pp:104-113,2012

www.jbino.com

# EFFECT OF NITROGEN FERTILIZER REGIME ON GROWTH AND YIELD TRAIT OF ISABGOL (*Plantago ovata*)

**Dr.Rajan Chaudhary**

**HoD Biology, Assistant Professor in Botany, BUC College, Batala-143505, Punjab, India**

(Received on Date : 29th June 2012 Date of Acceptance: 23rd July 2012)

## Abstract

Isabgol *(Plantago ovate Forsk*.) is an important medicinal and commercial crop valued for its seed husk, which is widely used in pharmaceutical, neutraceutical, and dietary industries. Nitrogen plays a pivotal role in influencing vegetative growth, reproductive development, and yield potential. The present study was conducted to evaluate the effect of different nitrogen fertilizer regimes on growth and yield traits of Isabgol under field conditions. Treatments consisted of varying nitrogen application rates and schedules, applied through urea in split doses. Growth parameters such as plant height, number of tillers, leaf area index, and days to flowering, along with yield attributes including spike length, number of spikes per plant, seed yield, and husk yield, were recorded. Results indicated that moderate to higher nitrogen levels significantly enhanced vegetative growth and yield traits, with optimum performance observed at intermediate nitrogen doses, beyond which diminishing returns and lodging tendencies were noted. The study concludes that adopting a balanced nitrogen regime can maximize Isabgol productivity while maintaining crop quality and reducing environmental risks associated with excessive nitrogen use.

**Keywords**: *Plantago ovata*, Nitrogen fertilizer, growth parameters, yield traits, husk yield, medicinal crop.

## INTRODUCTION

Since ancient times, the woodlands have been a prime location for the cultivation of medicinal plants and herbs. There has been a decrease in the area that is covered by forests over the past several decades as a result of the pressure of a rising population. At the same time, there has been a rise in the demand for herbs and medicinal plants as a result of an increased number of users and a rebirth in interest in indigenous medical practices. As a result, the forest resources are experiencing double the amount of pressure, and they are unable to successfully fulfil the whole demand for medical plants and herbs. [1]Due to the lack of cultivation and also due to the unscrupulous collection of these plants by unskilled individuals, a number of species have become vulnerable to extinction as a result of the continuous exploitation of these plants in forests. This happens as a result of the absence of regular developmental programs in the Agricultural and Forestry sectors. The problem of supply has arisen as a result of the rise in demand for indigenous pharmaceuticals, and it is no longer possible to assume that there is a sufficient number of medicinal plants available for the production of authentic drugs. Most people choose medical plants since they contain organic medications and their preparations do not generate any morbid side effects. As a result, medicinal plants are chosen.

Medicinal plants that are abundant in secondary metabolites serve as the primary foundation for the production of pharmaceuticals associated with Indian medical systems (including Ayurveda, Unani, and Siddha) as well as homoeopathy. The ancient Indian Systems of Medicine (ISM) is largely a plant¬ based Materiamedica making use of most of our natural flora. Many disorders, including as jaundice, bronchial asthma, rheumatoid arthritis, diabetes, and others, for which allopathic drugs have not yet been able to provide a cure, can be treated with ISM, which is considered the most appropriate or first line therapy.

The vast majority of individuals favour these organic pharmaceuticals and their preparations since they do not cause any adverse effects and are favoured by them. It serves practically the whole rural population of our country, which is mostly due to the lack of access to contemporary allopathic medical treatment in our rural areas.

The indigenous medication business relies on a significant quantity of the raw materials that are supplied by plants that grow wild in forest regions. These plants are classed as minor forest product. A significant number of the medical plants that are required by the trade are taken

mostly from wild growth, which results in the depletion of the precious medicinal plant riches (for example, Rauvolfia and Dioscorea). Our careless activities are causing this biological capital to be depleted at a rate that is quite concerning. At this time, our medical treasure is in jeopardy as a result of excessive extraction of natural resources without any regard for the preservation of those resources. This practice has resulted in the extinction or endangered status of a great number of species of medicinal plants that were formerly found in our nation. This should be avoided, and in order to preserve the plants that are used for therapeutic purposes, herbal gardens and gene banks covering significant medicinal plants should be developed.

A decrease in the supply of authentic and high-quality raw materials has led to an increase in the cost of medical formulations as well as a decline in the quality of these formulations. It is of the utmost importance to raise awareness among the general public, in especially among the rural masses, about the need of conserving the naturally abundant resources of medicinal plants that are found in this region. In addition, the commercial cultivation of several potential medicinal plants that are in low supply have to be begun in order to guarantee a continuous supply of authentic raw material of a high quality. It is possible that medicinal plants will be a significant sector for the development of rural areas. Increasing the public knowledge of the cultivation, conservation, and use of naturally accessible medicinal plant resources among the rural masses for the purpose of maximising the economic potential of these plants would result in the conservation and utilisation of this legacy in a prudent manner. As a result of their ability to survive in adverse conditions, the majority of medicinal plants are suitable for use in agriculture that is dependent on rainfall. In order to fulfil the requirements of the herbal medication business, it will be beneficial to increase the production of medicinal plants on the land of farmers or on private property, as well as on wasteland and in agroforestry systems. An extra source of employment and income will be made available to the rural population that is now without work as a result of this. In addition to this, we will be able to get patents for the agricultural methods, pharmaceuticals, and formulations that are generated from our indigenous medicinal programs. As a result, a resource for our medicinal plants may be developed through research projects that focus on the creation and production of medicinal plants.

**Effect of Nitrogen and Phosphorous on plant height:**

**[2]**Reported that by using line sowing method, it was observed that plant height increases with the gradual increase in application of Nitrogen, but the maximum plant height obtained with the application of 50 kg N/ha. Further higher dose of Nitrogen gives non significant results.

**[3]H**ave reported that 25 kg N / ha and 25 kg $P_2O_2$ / ha are required to be applied as basal doses and 25 kg N / ha as top dresser 30-40 days after sowing, for the optimum growth of the plant. By the application of above mentioned doses of the fertilizers and adopting line sowing method, in soil having pH 7.2 – 7.9 in warm-temperate region, plant can attain maximum height about 30-40 cm.

**[4]**Reported that the plant height is higher in line sowing as compared to broadcasting method. The application of 50 kg Nitrogen and 50kg /ha Phosphorous gives better plant height. Any further increase in Nitrogen or Phosphorous plant height starts decreasing.

**[5] R**eported that the application of Nitrogen, Phosphorous and their different combinations influenced all the traits of Isabgol significantly. Regarding plant height 45 kg N/ha and 25 kg P/ha increases the growth attributing characters like plant height and plant spread.

**[6] R**eported that the application of Nitrogen, Phosphorous and their different combinations influenced all the traits of Isabgol significantly and for better result of the growth factors (for broadcasting method application) the fertilizer requirements are minimal. Nitrogen and Phosphorous are applied at 25 kg N/ha and 25 kg $P_2O_5$/ha which are applied at sowing time. Half of Nitrogen as remaining dose may be applied at 3$^{rd}$ irrigation i.e. the time of spike formation.

**[7] H**aveinstalled experiment, in the experimental station of Zajan located in the north west of Iran, under silty- clay soil conditions. All the growth characteristics of Isabgol were clearly influenced by Nitrogen fertilizer. They reported that the best treatment for maximum height of *Plantago ovata*is to use of 150 kg /ha. in the above mentioned experimental station, applying half of which as BD and other half at flowering stage. The 150 kg/ha of Nitrogen fertilizer for this plant appeared to show best results of plant height i.e. (16.52 cm) in contrast to control i.e. (14.13cm) at the time of harvesting.

**[8] C**onducted a field experiment at Allahabad to study the effect of Nitrogen on line sowing as well as broadcasting method of cultivation. They concluded that application of Nitrogen influenced all the yield attributing characters significantly. Plant height was also found significantly higher up to 50 kg N/ha over less nitrogen treatment. The maximum plant height (34.26cm) can be established by the

application of 50 kg/ha Nitrogen. They further added that Psyllium crop may be fertilized with 50 kg N/ha and seeds should be sown in line sowing method.

**[9] H**ave studied the effect of five different fertility levels (0 kg N + 0 kg $P_2O_5$, 15 kg N + 0 kg $P_2O_5$, 15 kg N + 15 kg $P_2O_5$, 30 kg N + 15 kg $P_2O_5$ and 30 kg N + 30 kg $P_2O_5$ ) / ha on plant height of Isabgol in clay loam soil having pH 8.2 and found that the application of 30 kg Nitrogen / ha and 30 kg phosphorous / ha increases the plant height 16.60, 28.01 and 33.51 cm 45, 75 DAS and at harvest time in contrast to control 14.20, 24.04 and28.48 cm 45, 75 DAS and at harvest time.

**Effect of Nitrogen and Phosphorous on number of tillers per plant:**

**[10]**Performed the experiment with different levels of Nitrogen on various growth parameters and found that they influenced all the traits of Isabgol significantly. Further he reported that the application of nitrogen up to 40 kg/ha increased the number of tillers and spikes per plant. Further increase in dose of Nitrogen, reduce the number of tillers and spikes per plant.

**[11]**Have studied the effect of different fertility levels of Nitrogen for various growth parameters and reported that the application of 40 kg N/ha increases the number of tillers per plant.

**[12]**Conducted an experiment with 4 levels of nitrogen (0, 25, 50 and 75 kg/ha) and observed significant results for all the traits. As far as the maximum number of tillers and number of spikes / plant concerned, they reported that Nitrogen at 50 kg/ha gives the significant results.

**[7]T**he plot experiment was installed in the experimental station of Zajan located in the north west of Iran, under silty- clay soil conditions. All the growth characteristics of Isabgol were clearly influenced by Nitrogen fertilizer. They reported that the best treatment for maximum number of tillers / plant of *Plantago ovata*is to use of 100 kg /ha in the above mentioned experimental station, applying half of which as BD and other half at flowering stage. They observed that the utilization of 100 kg $ha^{-1}$ of nitrogen fertilizer for this plant appeared to show best results of number of tillers/plant i.e. (5.97) in contrast to control i.e. (4.16) at the time of harvesting.

**[8] C**onducted a field experiment at Allahabad to study the effect of Nitrogen on line sowing as well as broadcasting method of cultivation. They concluded that application of Nitrogen influenced all the yield attributing characters significantly. Number of tillers/ plant also found significantly higher up to 50 kg N/ha over less nitrogen treatment.

**Effect of Nitrogen and Phosphorous on**

**number of spikes per plant:**

**[13] H**ave studied the effect of different level of Nitrogen on number of spikes per plant of Isabgol and found that the maximum number of spikes per plant significantly effected by the application of 75 kg N/ha.

**[14] H**ave performed with various levels of Nitrogen to mark the effect on various yield parameters and reported that the application of 60 kg N/ha significantly increases the number of spikes per plant.

**[15] C**onducted a field experiment for different level of Nitrogen and found the significant results for all the traits and further reported that the highest number of spike per plant was obtained with the application of 45 kg N/ha.

**[4] C**onducted the experiment Nitrogen interaction with line sowing method and broadcasting method and found the significant results. Further they reported that the number of spikes per plant are higher in line sowing with the application of 45 kg N/ha.

**[12] C**onducted an experiment with 4 levels of nitrogen (0, 25, 50 and 75 kg/ha) and observed significant results for all the traits. Further they reported that Nitrogen at 50 kg/ha gives the highest number of tillers and spikes per plant

**[8] C**onducted a field experiment at Allahabad to study the effect of Nitrogen on line sowing as well as broadcasting method of cultivation. They concluded that application of Nitrogen influenced all the yield attributing characters significantly. They concluded that the highest number of spikes can be achieved by the application of 50 kg/ha Nitrogen.

**Effect of Nitrogen and Phosphorous on spike length:**

**[2]** Studied various aspect of growth parameters with different levels of Nitrogen and found significant results for all traits and further reported that maximum spike length was seen with the application of 50 kg N/ha.

**[15] C**onducted a field experiment for different level of Nitrogen and found the significant results for all the traits and further regarding the spike length they have concluded that maximum spike length was seen with the application of 45 kg N/ha.

**[4]** Studied the interaction of Nitrogen with different methods of sowing i.e. line sowing and broadcasting method and concluded that the spike length is greatening with the application of 60 kg N/ha and also found that the length of spike is seen higher in line sowing.

**[8] C**onducted a field experiment at Allahabad to study the effect of different levels of Nitrogen on line sowing as well as broadcasting method of cultivation. They concluded that application of Nitrogen influenced all the yield

attributing characters significantly in both the methods. As far as length of spike is concerned they reported that the maximum length of spikes can be achieved by the application of 50 kg/ha Nitrogen.

**[9] H**ave studied the effect of five different fertility levels (0 kg N + 0 kg $P_2O_5$, 15 kg N + 0 kg $P_2O_5$, 15 kg N + 15 kg $P_2O_5$, 30 kg N + 15 kg $P_2O_5$ and 30 kg N + 30 kg $P_2O_5$ ) / ha on length of spike of Isabgol in clay loam soil having pH 8.2 and found that the application of 30 kg Nitrogen/ha and 30 kg phosphorous/ha and found that the application of 30 kg Nitrogen/ha and 30 kg phosphorous/ha had maximum spike length 4.74cm in contrast to control 2.79 cm.

**Effect of Nitrogen and Phosphorous on number of Flowers/spike:**

**[7]**The plot experiment was installed in the experimental station of Zajan located in the north west of Iran, under silty- clay soil conditions. All the growth characteristics of Isabgol were clearly influenced by Nitrogen fertilizer. They reported that the best treatment for maximum number of flowers/ spike of *Plantago ovata*is to use of 100 kg /ha in the above mentioned experimental station, applying half of which as BD and other half at flowering stage. They reported that the utilization of 100 kg $ha^{-1}$ of nitrogen fertilizer for this plant appeared to show best results of number of flowers/plant i.e. (8.16) in contrast to control i.e. (5.46).

**Effect of Nitrogen and Phosphorous on number of seeds per spike:**

**[12] C**onducted an experiment with 4 levels of nitrogen (0, 25, 50 and 75 kg/ha) and observed significant results for all the traits. Further they reported that the application of 50 kg/N ha increases the number of seeds per spike.

**[4] S**tudied the interaction of Nitrogen with different methods of sowing i.e. line sowing and broadcasting method and concluded that the application of 60 kg N/ha increases significantly the number of seeds per spike and are also seen higher in line sowing.

**[8] C**onducted a field experiment at Allahabad to study the effect of different levels of Nitrogen on line sowing as well as broadcasting method of cultivation. They concluded that application of Nitrogen influenced all the yield attributing characters significantly in both the methods. Further they reported that the maximum number of seeds/plant can be achieved by the application of 50 kg/ha Nitrogen.

**Effect of Nitrogen and Phosphorous on 1000 seed weight:**

**[7]** The plot experiment was installed in the experimental station of Zajan located in the north west of Iran, under silty- clay soil conditions. All the growth characteristics of Isabgol were clearly

influenced by Nitrogen fertilizer. They reported that the best treatment for maximum number of flowers/ spike of *Plantago ovata*is to use of 100 kg /ha in the above mentioned experimental station, applying half of which as BD and other half at flowering stage. Further they reported that the utilization of 100 kg /ha of N- fertilizer, resulted the highest 1000 seed weight (6.27gm)

**Effect of Nitrogen and Phosphorous on seed yield and husk yield:**

**[16]** Studied the effect of progressive increase of different level of Nitrogen in Isabgol for various traits and found the significant results. Further they reported that seed yield of Isabgol increased progressively up to 60 Kg N/ha. Any further increase in level of Nitrogen seed yield was reduced.

**[16] H**ave studied the effect of different level of Nitrogen on various characters of Isabgol and found significant results. Regarding seed yield of Isabgol and they found that the better seed yield was obtained with application of 20 kg N/ha. followed by 40 kg N/ha.

**[17] W**orked out on the various aspects of growth parameters of Isabgol by the application of different levels of Nitrogen and regarding seed yield he has reported that the higher seed yield was obtained with application of 20-40 kg N/ha.

**[18]** Have studied the effect of different level of Nitrogen on various characters of Isabgol and found significant results. Further theyreported that 25 kg N/ha applied as basal does at last ploughing and 25 kg N/ha top-dressed at 39 days after seed sowing found better seed yield.

[19] have also reported 25 kg /ha as basal dose at first irrigation step and 25kg/ha aerial dose at $2^{nd}$ irrigation results maximum yield of seed and water use efficiency of blond psyllium(*Plantago ovata*Forsk).

**Conclusion**

The present investigation clearly demonstrates that nitrogen fertilizer regime has a significant influence on the growth and yield traits of Isabgol (Plantago ovata). Optimum nitrogen application promoted better vegetative growth, enhanced spike development, and improved seed as well as husk yield. Excessive nitrogen, however, did not proportionally increase yield and in some cases led to lodging and delayed maturity. Based on the findings, a balanced nitrogen dose, applied in split intervals, can be recommended to maximize productivity while maintaining economic viability and minimizing environmental impacts. Adoption of the appropriate nitrogen management strategy is therefore essential

for sustainable cultivation and improved profitability of Isabgol.

**References:-**


**[1] Bist, LD.; Singh, AK. andKewalanand (2001).**Effect of nitrogen doses on growth and yield of blond psyllium (*Plantago ovata*).*Indian J. of Agricultural Sci.* 2001, 71:11, 709 – 710.

**[2] Chandawat MS. (1997).** Effect of irrigation schedules and nitrogen levels on yield and water use efficiency of blond psyllium (*Plantago ovata*Forsk) Ph.D. Thesis, Deptt. Of Agronomy, R.C.A, Udaipur.

**[3] Chemexcil and Newsletter, (1998).** Basic chemical pharmaceuticals and cosmetics export promotion council. *(Ministry of Commerce Govt. of India, Mumbai.)*

**[4] G.Karimzadeh and R. Omidbaigi (2004).** Growth and seed characteristics of Isabgol (*Plantago ovata*Forsk) as influenced by some environmental factors.*J.Agric.Sci.Tecnol.***Vol.6**: 103-110

**[5] Kalayansundran, N.K., Sriram, S., Patel B.R., Patel, D.H., Dalal, K.C. and Gupta, R.(1984).**Psyllium; a Monopoly of Gujarat *Indian Horti.*,28 (4) 35 – 37 and 41.

**[6] Kulmi, G.S. (1998).** Effect of nitrogen levels on growth and yield of Isabgol 12th All India workshop on Medicinal and Aromatic Plants, held at C.C.S, *Haryana Agricultural University Hissar*. 134 – 135.

**[7] Lal R.K., Mishra P.N. and Kumar S.(2000).** Isabgol (*Plantago ovata*) and its cultivation in India. Farm Bulletin No. 14. Central Institute of Medicinal and Aromatic Plants, Lucknow. Pp. 1-11

**[8] Lekhchand and R.C. Dadheech(2008).** Effect of sowing dates, fertility levels and farmyard manure on growth and yield of Isabgol (*Plantago ovata*Forsk.) *Journal of Medicinal and Aromatic Plant Sciences* **30** Pp 356 -58.

**[9] Maheshwari, S.K.; Sharma, S.K. and Gangrade, S.K. (1998).**Effect of nitrogen and phosphorus on yield and quality of Isabgol in Vertisol (Irrigated). 12th All India Workshop on Medicinal and Aromatic Plants, held at C.C.S, *Haryana Agri. Univ. Hissar* : 133.

**[10] Mann, P.S. and Vyas, A.K. (2001).** Effect of sowing dates and nitrogen level on the yield, quality and net returns of blond psyllium (*Plantago ovata*Forsk).*Annuals of Agri.-Research.*. 22:3, 425 – 428.

[11] **MIR et al (2007) .**Impact of different levels of Nitrogen by line sowing method on the different parameters of growth and cultivation of Isabgol.*Indian Journal Agricultural Sciences***47:** 874 -879

**[12] Ramesh, M.N.; Farooqi, A.A.; Thilak; Subbaiah and Subbaiah, T (1989).**Influence of sowing date and nutrients on growth and yield of Isabgol

(Plantago ovataForsk.)Crop-Research-Hissar., 2:2, 169 – 174.

**[13] Randhawa, G.S.; Sindhu, B.S.; Maley, R.K and Saini, S.S (1978)**.Effect of nitrogen and phosphorus on the growth and yield of psyllium (*Plantago ovata* F.) *J. Research, Punjab Agri. University Ludhiana* 19 (2): 120 – 122.

**[14] ShamsuddinTunio (2005)** Production of Psyllium Seed-A Potential Medicinal and Cash Crop. *HamdardMedicus* Vol. XLVIII, No.3, 52-54

**[15] Sharma, P.K.; Yadav, G.L.; Sudesh Kumar and M.M. Singh (2003).**Effect of methods of sowing and nitrogen levels on the yield of psyllium (*Plantago ovata*).*Jour. of Medicinal and Aromatic Plant Sciences.*25. Pp. 672 - 674.

**[16] Singh, P.; Jain, K.K; Sharma, S.K (2003).**Response of Isabgol (*Plantago ovata*Forsk.) of sowing time and nitrogen.*Jour. of Maharashtra Agri. University.*28:3, 332 – 323.

**[17] Singh; Ishwar; Chauhan, G.S and Singh, I. (1994).**Effect of mixtatol and different combinations of nitrogen and p0hosphorus fertilizer on growth and yield of blond Psyllium (*Plantago ovata* F.)*Indian Jour. of Agronomy.* 39 (4) 711 – 712.

**[18] Singh, Rajendra (1978).**Effect of nitrogen and phosphorus on yield and quality of Isabgol (*Plantago ovata* F.) M.Sc. (Ag.) Thesis Submitted to *Punjab Agri. Univ., Ludhiana.*

[19].**Swarupa;Utgiker; Sadawarte,K.T.; Wankhade,S.G.;Utgiker,S (2003)**. Growth and yield of Isabgol (*Plantago ovata*Forsk)as influenced by Nitrogen and Phosphorous levels. Agricultural Sci.Digest.2;1, 77-78.