CHAPTER-III

REVIEW OF LITERATURE
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Limited literature concerning to cultivation of isabgol particularly in relation to the effect of plant population (As seed rates) and fertility levels are available in the country and abroad. Now several desirable plant types are being evolved by the plant breeders which heterogeneous genetic behavior under varying agroclimatic condition. The available literature on pertaining to the genetic ability of crop varieties under varying plant densities as well as fertility levels are reviewed in this chapter.

Effect of plant densities (As seed rate):

Optimum plant population per unit area is an essential component to obtain maximum production from a given area. Desirable plant densities varies accordingly to plant types of agroclimatic conditions and agrotechniques used for cultivation of crop.

Randhawa et al. (1978) studied the effect of seed rate of isabgol on the growth and yield in sandy-loam soil of Punjab and concluded from the results that increasing seed rate from 5 to 10 kg/ha increased the seed yields, but differences beyond 7.5 kg/ha was not significant. They also added that increase in seed yield due to increasing rate upto optimum seed rate attributed to the greater number of spike/unit area. These results were in conformity with the
findings of Mehta et al. (1976). But a trial conducted under AICRP (Anonymous, 1981) at Anand the seed rate of 4 kg/ha was optimum.

McNeil (1989) evaluated the effect of two seeding rates 6 to 12 kg/ha on weed infestation and seed yield in Plantago ovata in western Australia and concluded from the results that higher seeding rate reduced weed infestation with increased seed yields, but differences were not significant.

From the results of a series of trials conducted in western Australia (McNeil, 1990) on seed yield in Plantago ovata, reported that seed rate changed by a factor of (4 to 16 kg/ha). There was a quadratic response by yield giving a maximum reduction rate (8 kg/ha yielding 2 tones/ha). Spike length and number of spikes/ha accounted for most of the changes in yield. Seed weight, spikes, fertility and flower packing density were less affected. All the yield components tended to vary together in the same direction as yield rather than sowing compensation affects as environmental suitability was altered.

Singh et al. (1993) recorded that increased the grain and straw yield of wheat with increasing seed rates from 100 to 150 kg/ha. But benefit : cost ratio was the highest with 125 kg seed/ha.

Nema et al. (1995) emphasized that sugarcane+isabgol intercropping without additional use of fertilizers, isabgol led to record the highest sugarcane yield equivalent (139.7 t/ha), maximum net
return (Rs. 41880/ha and benefit cost ratio (2:7) at Jaora, Ratlam (M.P.).

From the results of a series of studies in Isabgol conducted in shallow black soil of Indore having an average fertility during rabi season of 1995 to 1999.

Pandey et al. (1999) reported that effective tillers/unit area, seed yield, straw yield and net return/area increased significantly by increasing seed rates up to 150 kg/ha in timely soon wheat at pusa (Bihar). Further increased in seed rate, failed to produced any significant effect on these parameters.

Sharma et al. (2001) concluded that a seed rate of 6 kg/ha was optimum to improve the growth parameters, yield attributes and seed yield.

On looking the over all picture of above mentioned views, it is apparent that though higher seed rates result with higher plant density just after germination, later on the formation of tillers reduce drastically during advanced growth stages due to increased intra-row competition among the growing seedlings for light, space, nutrients and water. The widely spaced seedlings under low seed rates produced increased number of tillers and even these tillers appear to be more healthy also as a consequence, the productive tillers at final stage were found in more number owing to increased economic yields.
EFFECT OF FERTILITY LEVELS:

Iyengar et al. (1968) carried out the experiments in the J.N.A.M. garden, Kothrud (Maharashtra) during 1966-67 with a view to find out yielding ability of Isabgol in relation to application of manures. Five fertilizer levels viz. N, NP, NK, NPK and control were tested for their influence on the seed yield. From the results they concluded that fertilizer levels did not influence the seed yields of Isabgol significantly.

Modi et al. (1974) suggested to apply 50 kg N and 25 kg P$_2$O$_5$/ha for good growth and seed yield of psyllium in Gujrat.

From the results of an experiment conducted in Punjab (Randhawa et al., 1978) concluded that the seed yield increased with the increase in Nitrogen application up to 60 kg N/ha. But in an other experiment, they did not found increase in seed yields beyond 20 kg Nitrogen/ha. Because of higher native, nitrogen status of the soil. Similar results were reported by Kalyanasundaram et al. (1984), also they emphasized that application of 25 kg N/ha each at basal and then top dressing at 39 days after sowing gave maximum seed yields. They strongly pointed out that the crop has low nitrogen requirement and unless the soil is very low in available nitrogen (120 kg/ha), it need not be fertilized. Under such circumstance, taking a preceding legume crop will restore the desirable soil fertility. Hence it
is necessary to estimate the available soil nitrogen before deciding the application of Nitrogen to Isabgol.

Earlier, Gupta (1982) also mentioned that high nitrogen used over and above 25 kg/ha had no positive effect on yield of Isabgol.

Samya and Gill (1986) conducted an experiment in loam soils at Ludhiana (Punjab) with 3 levels of Nitrogen (0, 20 and 40 kg N/ha) through organic and inorganic sources in Isabgol during 1979-80 and 1980-81. They observed significant increase in seed yield any up to 20 kg N/ha, but the sources of nitrogen and their different combinations failed to influence the seed yield significantly during both the years. The optimum dose was found to be 28.5 kg/ha. Similar results were reported by Singh (1978) also from Ludhiana (Punjab).

Ramesh et al. (1989) conducted a field experiment at Bangalore to determine the influence of application of nitrogen and phosphorous on growth and yield of Isabgol.

Results revealed that applied nitrogen and phosphorous influenced very few parameters like leaf production and seed maturity. Nitrogen delayed seed maturity, but at 75 kg/ha in combination with 25 kg/ha of phosphorous produced the maximum number of spikes.

According to Singh et al. (1991) number of spikes/plant, seed weight 1000, grain and seed yield of Plantago ovata CV. Gujrati-Isabgol-2 increased with the increasing nitrogen and phosphorus up
to 60 + 30 Kg/ha in sandy-loam soils of Rajasthan. While plant height, spike length and grain/spike increased with up to 80+40 kg/ha.

Ramesh et al. (1992) studied the effect of combination of three levels of nitrogen viz. 50, 75 and 100 kg/ha and three levels of P$_2$O$_5$ viz. 0, 25 and 50 kg/ha with a constant of 25 kg K$_2$O/ha on growth-yield of Isabgol at Bangalore. From the results they concluded that different fertilizer rates had little effect on vegetative growth and yield attributes.

According to Singh et al. (1993) the application of recommended fertilizer (125 N + 60 kg P$_2$O$_5$ + 50 kg K$_2$O) increased the yield and yield attributes of wheat, but benefit : cost ratio was highest with 50% of the recommended fertilizers (60 kg N + 30 kg P$_2$O$_5$ + 25 kg K$_2$O/ha).

Dalal and Sriram (1995) emphasized that Isabgol crop requires low nitrogen and unless soil is very low in available N (120 kg/ha), no nitrogen should be supplied to the crop.

Parihar and Singh (1995) concluded from the results of the experiment conducted at Mandor (Rajasthan) that psyllium variety GI-2 responded significantly only upto 20 kg N and 20 kg P$_2$O$_5$/ha under western Rajasthan conditions.

Singh et al. (1996) at Udaipur (Rajasthan) determined the economic viable combination of nitrogen and phosphorus level in isabgol (Plantago ovata) they recorded the highest net income with the
application of 30 kg N + 15 Kg P₂O₅/ha (Rs. 27668/ha) followed by 45 kg N + 15 kg P₂O₅/ha (Rs. 27095/ha). Application of 30 kg N + 15 kg P₂O₅/ha also resulted in higher benefit: Cost ratio (5:37) as compared to all other combinations. They further resulted that application of 15 kg N/ha alone led to record maximum profit per rupee investment was Rs. (101.6).

Patel et al. (1996) conducted a field experiment during winter season of 1989-91 on 'Gujarat Isabgul I' blond psyllium (Plantago ovata Forsk) at Junagadh on medium black clayey-soil to find out the suitable fertilizer requirement. From the results they concluded that application of 20 kg/ha each of nitrogen and phosphorus increased number of tillers/plant, plant height and seed yields under South Saurashtra agro-climatic conditions. These findings are in close agreement with those of Randhawa et al. (1982) and Samya and Gill (1986).

Mann and Vyas (1999) found at Udaipur that application of 45 kg N/ha in isabgol significantly increased the plant height, number of leaves/plant, and dry matter accumulation.

Maheshwari et al. (2000) conducted an experiment in shallow black soil of Indore (Madhya Pradesh) during winter season of 1996 and 1997, to find out the effect of fertilizers on the growth, yield and quality of blond psyllium or isabgol (Plantago ovata Forsk). They recorded maximum plant height, number of spike-bearing tillers and
length of spikes with 25 kg N/ha without phosphorus application. It also gave 33% higher seed yield over control.

Reddy et al. (2000) conducted a experiment at Hydarabad and found that application of 150 kg N/ha recorded more plant height, number of leaves, level of phosphorus 90 kg/ha produced more plant height followed by 60 and 30 kg/ha while leaf number/plant did not differ significantly among different levels of phosphorus including control.

Singh and Pal (2000) conducted the micro-plot experiment for two years continuously during rabi season at Research Farm, Bichpuri, Agra to evaluate the performance of blonde psyllium in two types of saline water having salinity levels: \( E_1 \) (\( EC_{iw} 2.4 \) dSm\(^{-1}\)); \( E_2 \) (\( EC_{iw} 12 \) dSm\(^{-1}\)) and five levels of fertility: \( F_1 \) (control), \( F_2 \) (50 kg N + 25 kg P\(_2\)O\(_5\) ha\(^{-1}\)), \( F_3 \) (50 kg N + 25 kg P\(_2\)O\(_5\) + 25 kg K\(_2\)O), \( F_4 \) (25 kg N + 25 kg P\(_2\)O\(_5\) + 20 kg ZnSO\(_4\)) and \( F_5 \) (50 kg N + 25 kg P\(_2\)O\(_5\) + 25 kg K\(_2\)O + 20 kg ZnSO\(_4\) ha\(^{-1}\)). Pooled data of two seasons revealed that water salinity \( EC_{iw} 12 \) dSm\(^{-1}\) significantly decreased the ear length, number of grains/ear and 1000-grain weight (g), grain, husk and straw yield as compared to salinity control (\( EC_{iw} 2.4 \) dSm\(^{-1}\)). The interaction effect of fertility and salinity results showed that application of \( EC_{iw} 12 \) dSm\(^{-1}\) decreased the grain yield by 28.60, 32.29, 29.37, 31.22 and 27.56%; husk yield by 27.94, 31.40, 28.41, 30.17 and 26.45% in \( F_1 \), \( F_2 \), \( F_3 \), \( F_4 \) and \( F_5 \) fertility levels, respectively, as compared to control.
(EC<sub>iw</sub> 2.4 dSm<sup>-1</sup>). At EC<sub>iw</sub> 12 dSm<sup>-1</sup>, the fertility levels F<sub>2</sub>, F<sub>3</sub>, F<sub>4</sub> and F<sub>5</sub> enhanced the grain yield by 52.56, 80.30, 63.69 and 103.42%; husk yield by 53.06, 81.63, 65.30 and 106.12% and straw yield by 24.85, 48.74, 37.40 and 55.02% as compared to control F<sub>1</sub>. The order of the superiority of treatments was F<sub>5</sub> > F<sub>3</sub> > F<sub>4</sub> > F<sub>2</sub> > F<sub>1</sub> for yield and yield attributes.

Thakuria and Gogoi (2000) emphasized that yield attributes and yield of buckwheat (Fagopyrum esculentum) a identical herb to Isabgol increased significantly with 20:10:10 kg NPK/ha. The increased in seed and straw yields were 29.3% and 35.7% higher respectively over the control, but the harvest index decreased with the application of fertilizer over control.

Sharma <i>et al.</i> (2001) conducted a series of studies in shallow black soils of Indore (M.P.) having average fertility in during rabi season of 1995 to 1999 on different improved agro-techniques for isabgol. From the results, they concluded that plant height, number of effective tillers and length of spikes were maximum with 25 kg N/ha as compared to control. Application of phosphorus and culture did not have effects on seed yield and yield quality and attributes of isabgol.

Mann and Vyas (2001) found at Udaipur (Rajasthan) that the seed yield of blonde psyllium increased significantly upto 30 kg N/ha. The increase in seed yield with 45 kg N/ha application over 0, 15 and
30 kg N/ha was in the order of 54%, 25.6 and 0.4 per cent respectively. The yield enhancement was attributed to the favourable effect of nitrogen application on yield attributing characters viz. number of spikes/meter row length, spike length and spikelets/spike.

On going through the above mentioned facts in detail, it could be concluded that fertilizer requirement of this crop varies according to soil-type, crop-variety and managerial factors etc. Therefore, this field deserves a critical study to determine the suitable requirement of essential nutrients particularly nitrogen and phosphorus to this crop under the agroclimatic conditions of Vindhyan Plateau zone of M.P.