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Genotypic performance of grass pea (*Lathyrus sativus* L.) under varying sowing windows

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Abstract

The experiment was conducted on effect of grass pea genotypes on yield attributes, yield and economics under different sowing windows during *rabi* season of 2025-26 at Agronomy Farm, College of Agriculture, Nagpur. The experiment was laid out in split plot design with four sowing windows viz., 42nd MW (S₁), 43rd MW (S₂), 44th MW (S₃) and 45th MW (S₄) as main plot treatments and three grass pea genotypes viz., Ratan (G₁), Prateek (G₂) and NLK-73 (G₃) as sub plot treatments and replicated thrice. Results revealed that 44th MW (S₃) recorded significantly higher number of pods plant⁻¹, number of seeds pods⁻¹, seed index, seed, stover, biological yield, harvest index, net monetary return and B: C ratio as compare with the 42nd MW (S₁), 43rd MW (S₂), and 45th MW (S₄). Among the genotypes, Ratan (G₁) recorded higher number of pods plant⁻¹, number of seeds pods⁻¹, seed index, seed, stover, biological yield, harvest index, net monetary returns and B: C ratio in comparison with Prateek (G₂) and NLK- 73 (G₃). Interaction effect between sowing windows and genotypes was found nonsignificant in all the parameters.

Keywords: Grass pea, sowing windows, genotypes, yield attributes, yield

Introduction

Grass pea (*Lathyrus sativus* L.) is an important pulse crop of the family Fabaceae, commonly known as khesari, lang, chural, latri, batura, lakhori and tiwra in India (Campbell, 1997) [3]. It is a hardy annual legume with well-developed roots and nodules capable of fixing atmospheric nitrogen, contributing to soil fertility under low-input conditions (Campbell *et al.*, 1993) [4]. The crop is well adapted to drought-prone, marginal and rainfed environments.

Grass pea is an important source of plant protein, with seed protein content ranging from 8.6 to 34.6%, along with 48.0 -52.3% of carbohydrates and 1.1% -1.7% crude fibre (Tamburino *et al.*, 2012; Longvah *et al.*, 2017; Campbell, 1997; Hanbury *et al.*, 1999) [16, 12, 3, 8]. The seeds are consumed as pulse, dal and flour, while immature pods, young leaves and crop residues are used as vegetables and livestock feed, contributing to food and feed security (Tyagi *et al.*, 2017) [17].

In India, about 0.362 million ha area was under grass pea cultivation in India, with Chhattisgarh ranking first in area and production, followed by Bihar and Madhya Pradesh (Department of Agriculture and Farmers Welfare). In Maharashtra, the crop is mainly grown in the Eastern Vidarbha region, particularly in Bhandara, Chandrapur, Gadchiroli, Gondia and Nagpur districts, where it is cultivated after rice using residual soil moisture. Under proper management, the crop can produce about 8–10 q ha⁻¹ under direct sowing and 3–4 q ha⁻¹ under utera cultivation (Dixit *et al.*, 2016) [5].

Grass pea (*Lathyrus sativus* L.) is an important pulse crop of rainfed and marginal ecosystems; however, its productivity remains low and unstable under field conditions due to inadequate agronomic practices. Among these, sowing time is a key non-monetary factor that strongly influences crop establishment, phenological development and final productivity (Rafaat *et al.*, 2021) [14]. Ghosh and Khan (2018) [6] reported that variation in sowing dates significantly affected yield and yield attributes of grass pea, with optimum sowing resulting in higher grain yield, whereas delayed sowing reduced yield mainly due to poor development of yield components and lower test weight. The selection of suitable genotypes with stable performance, along with appropriate agronomic management, is essential under variable environmental conditions (Kamdi

et al., 2017) [9].

Hence, based on the above considerations and climate change context, the experiment was conducted to evaluate the response of different grass pea genotypes on yield attributes, yield and economics under different sowing windows.

Materials and Methods

A field experiment was conducted at Agronomy Farm, College of Agriculture, Nagpur during *rabi* season of 2025-26. The soil of the experimental field was clayey in texture, low in available nitrogen (249.71 kg ha⁻¹) and phosphorus (22.30 kg ha⁻¹) and rich in available potassium (368.03 kg ha⁻¹). Organic carbon content (0.56%) was medium and soil reaction was slightly alkaline pH (7.5). The experiment was laid out in split plot design with 12 treatment combinations replicated thrice, comprising four sowing windows viz., 42nd MW (S₁), 43rd MW (S₂), 44th MW (S₃) and 45th MW (S₄) as main plot treatments and three genotypes of grass pea viz., Ratan (G₁), Prateek (G₂), and NLK-73 (G₃), as sub plot treatments. Grass pea was sown manually with 30 cm X 10 cm spacing during the meteorological week-based sowing windows. Observations were recorded from net plot area and then adjusted to ha⁻¹ value using hectare factor conversion. Statistical analysis was applied to data and cost of cultivation was estimated by using prevailing market price of grass pea.

Results and Discussion

Yield attributes

Effect of sowing window

Significantly higher numbers of pods plant⁻¹, seeds pod⁻¹ and seed index were recorded in the 44th MW (S₃) compared with the other sowing windows, followed by the 43rd MW (S₂). These yield attributes were lowest in the 45th MW (S₄). This might be due to favourable temperature during the reproductive and seed-filling

stages, which promoted better reproductive development, seed setting and assimilate accumulation. Similar findings were reported by Ghosh and Khan (2018) [6] and Gusmao (2018) [7].

Effect of genotypes

Among the evaluated grass pea genotypes, Ratan (G₁), produced significantly higher numbers of pods plant⁻¹, seeds pod⁻¹ and seed index and was superior to Prateek (G₂) and NLK-73 (G₃). This might be due to greater genetic potential for branching, reproductive efficiency and seed development. Similar findings were reported by Laghari *et al.* (2016) [11], Sleman *et al.* (2019) [15] and Bag *et al.* (2023) [2].

Table 1: Number of pods plant⁻¹, number of seeds pods⁻¹ and seed index (g) as influenced by various treatments

Treatments	Pods plant ⁻¹	Seeds pod ⁻¹	Seed index (g)
A. Main plot treatments - Sowing windows			
S ₁ - 42 nd MW	21.84	3.27	7.07
S ₂ - 43 rd MW	24.62	3.47	7.19
S ₃ - 44 th MW	27.67	3.67	7.38
S ₄ - 45 th MW	19.73	3.07	6.72
SE (m) ±	0.67	0.05	0.04
CD @ 5%	2.33	0.17	0.15
B. Sub plot treatments - Genotypes			
G ₁ - Ratan	27.38	3.63	7.50
G ₂ - Prateek	23.13	3.33	7.06
G ₃ - NLK-73	19.88	3.13	6.71
SE (m) ±	0.58	0.04	0.04
CD @ 5%	1.75	0.12	0.11
C. Interaction effect			
SE (m) ±	1.17	0.08	0.07
CD @ 5%	NS	NS	NS
GM	23.46	3.37	7.09

Table 2: Seed yield (kg ha⁻¹), Stover yield (kg ha⁻¹), Biological yield (kg ha⁻¹), Harvest index (%), NMR (₹ ha⁻¹) and B:C ratio of grass pea as influenced by various treatments

Treatments	Yield (kg ha ⁻¹)		Biological yield (kg ha ⁻¹)	Harvest index (%)	NMR (₹ ha ⁻¹)	B:C ratio
	Seed	Stover				
A. Main plot treatments – Sowing windows						
S ₁ - 42 nd MW	914	3041	3954	23.06	22480	1.86
S ₂ - 43 rd MW	1020	3240	4260	23.87	27968	2.07
S ₃ - 44 th MW	1087	3409	4496	24.12	31503	2.20
S ₄ - 45 th MW	825	2846	3671	22.47	17840	1.68
SE (m) ±	17	29	44	0.06	868	-
CD at 5%	58	99	152	0.20	3004	-
B. Sub plot treatments - Genotypes						
G ₁ - Ratan	1063	3292	4355	24.32	30204	2.15
G ₂ - Prateek	956	3122	4079	23.38	24685	1.94
G ₃ - NLK-73	864	2988	3852	22.43	19955	1.76
SE (m) ±	14	25	38	0.29	738	-
CD at 5%	43	75	114	0.87	2213	-
C. Interaction						
SE (m) ±	29	50	76	0.58	1476	-
CD at 5%	NS	NS	NS	NS	NS	-
GM	961	3134	4095	23.38	24948	1.95

Crop Yield Performance

Effect of sowing window

Significantly higher seed yield, stover yield, biological yield and harvest index were obtained with sowing in the 44th MW (S₃) compared with the other sowing windows, followed by the 43rd MW (S₂), while the lowest values were recorded in the 45th MW (S₄). This might be due to favourable temperature during flowering, pod setting and seed filling, which promoted better

biomass accumulation, pod retention, seed development and efficient partitioning of assimilates towards seed yield. Similar findings were reported by Ghosh and Khan (2018) [6], Gusmao (2018) [7] and Rafaat *et al.* (2021) [14].

Effect of genotypes

Among the evaluated grass pea genotypes, Ratan (G₁) recorded significantly higher seed yield, stover yield, biological yield and

harvest index than Prateek (G₂) and NLK-73 (G₃), while NLK-73 (G₃) recorded the lowest values. This might be due to genetic differences in branching, biomass accumulation, reproductive capacity and assimilate partitioning, resulting in greater pod and seed development in Ratan (G₁). Similar findings were reported by Laghari *et al.* (2016) ^[11], Sleman *et al.* (2019) ^[15], Mahapatra *et al.* (2020) ^[13] and Bag *et al.* (2023) ^[2].

Monetary returns

Effect of sowing window

Grass pea sown during the 44th MW (S₃) recorded significantly higher net monetary return and benefit ratio compared with the 43rd MW (S₂) and 42nd MW (S₁), whereas sowing during the 45th MW (S₄) recorded the lowest net monetary return and benefit ratio. This might be due to higher seed and stover production under the optimum sowing window, while delayed sowing reduced crop productivity and consequently economic returns. Similar findings were reported by Majid AghaAlikhani *et al.* (2014) ^[1] and Ghosh and Khan (2018) ^[6].

Effect of genotypes

Among the genotypes, Ratan (G₁) recorded significantly higher net monetary return and benefit ratio than Prateek (G₂) and NLK-73 (G₃). This might be due to its higher seed and stover production associated with superior growth and yield-attributing characters, resulting in greater net returns. Similar findings were reported by Bag *et al.* (2023) ^[2] and Krishna *et al.* (2023) ^[10].

Interaction effect

Yield attributes, crop yield performance and economics were not significantly influenced by the interaction effect of sowing windows and genotypes. (Table1 and 2)

Conclusion

Sowing window and genotype had a pronounced effect on the yield attributes, yield and economic performance of grass pea. Results revealed that the crop sown during the 44th MW (S₃) performed best, as favourable temperature conditions during flowering, pod setting and seed filling supported better reproductive development and seed formation, resulting in higher productivity and economics whereas yield and yield attributes declined with successive delay in sowing, with the lowest performance recorded under the 45th MW (S₄). Among the genotypes, Ratan (G₁) was superior for yield, yield attributes and economics which may be attributed to its superior genetic potential.

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