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To determine the influence of different nitrogen doses and spacing on the growth and development of field pea (*Pisum sativum* L.)

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ABSTRACT

During the rabi season of 2022-23, a field experiment was carried out at the Himalayan University farm in Arunachal Pradesh. To determine the influence of different nitrogen doses and spacing on the growth and development of field pea (*Pisum sativum* L.) The experiment were laid out in Randomized Block Design and replicated thrice with 7 treatments T_1 N1(30 kg ha^{-1})+S1(30x 10 cm), T_2 N1(30 $kgha^{1}$)+S2(35x10cm), T_3 N1(30 kg ha^{-1})+S3(40x10cm), T_4 N2 (50 kg ha^{-1})+S1 (30x10 cm),T_5 N2(50 $kgha^{-1}$)+S2 (30x10 cm), T_6 N2(50 kg ha^{-1})+S3 (40x10 cm) and T_7(Control Plot). Observation on plant height (cm), number of leaves $plant^{-1}$, number of branches $plant^{-1}$, Dry weight (g $plant^{1}$), CGR(g m^{-2} day^{-1}) and RGR(g g day^{-1}) were recorded. The treatment T_2 N1 (30 kg/ha)+S2 (35x10 cm) displayed significant increase in growth and development of pea as compared to the control plot and statistically at par with treatment T_1 N1(30 $kgha^{1}$)+S1(30x10cm). Plant height (43.3), number of leaves $plant^{-1}$(22.10), number of branches $plant^{-1}$(2.90), dry weight $plant^{-1}$(g) (19.20), CGR (0.23) and RGR (0.03) were observed highest in T_2.

***Key word**: Nitrogen, Spacing, Growth, Pea*

Introduction

Field pea is a dry, shelled product used by humans and cattle that is a popular food crop due to its high nutritional content and simplicity of cultivation. India is a major producer, accounting approximately 7% of total global output. India's Uttar Pradesh and Madhya Pradesh are key producers, producing a total of 7.8 lakh tonnes. Field peas are packed with nutrients such as digestible protein, carbohydrate, sugar, vitamins, and minerals.

Plants suffer from stunting and poor growth as a result of nitrogen deficit more nitrogen availability stimulates faster protein synthesis, leaf development, and a bigger assimilation surface, resulting in greener pod output. (Bhopal and Singh, 1990).

Peas, as a leguminous crop, have a low nitrogen requirement. A larger nitrogen dose reduces nodulation and nitrogen fixation (Choudhary, 1967). Plants mostly acquire nitrogen from the soil in the form of solution; however legume crops can use atmospheric nitrogen via biological fixation by rhizobium. According to (Choudhary *et al*., 1972) the initial dose of nitrogen to legumes promotes plant growth and development, resulting in increased output.

Planting spacing has a considerable impact on pea growth and development, with closer spacing increasing disease and lowering yield. By reducing competition for light, nutrients, and moisture, opti-

mal spacing supports healthy development and seed quality. Plant size, flexibility, leaf area, and seed rate all have an impact on appropriate spacing.

Materials and Methods

The research study was conducted at Himalayan University in Itanagar during the rabi season 2022. The Crop Research Farm, located in the Eastern Himalayan region, was a subtropical agro-climatic zone in Arunachal Pradesh. The soil was sandy loam with high acidic concentration and organic matter level. Seven treatments were tested, and seeds were sown in November 2022 and harvested in February 2023. The cropping season had mean temperatures of 12 and 22°C, morning and night humidity of 91% and 70% respectively.

Results and Discussion

Growth Parameters

Plant Height (cm)

Data for pea growth attributing characters can be recorded and analysed in (Table 1). Nitrogen levels and spacing influenced plant height in peas considerably and favourably, with T2 having the greatest height (43.03 cm) compared to other treatments, indicating a low nitrogen requirement. T7, on the other hand, resulted in a marginally lower plant height (34.47 cm). Similar results were found by other researchers. According to Devi *et al.* (2022), a 30kg N/ha treatment is ideal for good pea growth and development, which is compatible with Choudhary's findings. The greatest plant height was measured at 30x15cm, and a 30kg N/ha and 30x10cm spacing combination was found to be optimal.

Number of leaves plant^{-1}

At various stages of plant growth, the number of leaves per plant was recorded (Table 1). Spacing has a considerable effect on plant growth, with treatment T2 having a significant effect on leaf number (22.10 cm) at harvest. Treatment T7 yielded a lower result (14.83cm). More leaves per plant result from wider spacing because it allows for vertical and horizontal leaf expansion. Nitrogen, which is essential for plant growth, increases the creation of chlorophyll molecules and photosynthesis. Similar findings have been reported by (Kumar and Pandey, 2008) and (Lazim, 1972).

Number of branches plant^{-1}

At various phases of plant development, the number of branches per plant was counted (Table 1). Spacing significantly affects the number of branches per plant, with treatment T2 having a significant effect (2.90 cm) at harvest while Treatment T7 showed a lower number of leaves per plant (1.93 cm). Wider row spacing leads to more horizontal growth and canopy area. The closer spacing resulted in the fewest branches per plant by Shaukat *et al*. (2012) in pea and also 30kg N/ha application has been determined to be optimal for favourable pea growth and development when compared to greater nitrogen doses of 50 kg N/ha (N2 level) and is consistent with the findings of other researchers. Choudhary *et al.* (1972) and Pandey *et al.*, (2017)

Dry weight plant^{-1} (g)

The dry weight was determined to be significant at all phases shown in (Table 2). Treatment T2 had the greatest increase in dry weight plant^{-1} (19.20g),

Table 1. Influence of different doses of nitrogen and spacing on plant height(cm), number of branches plant^{-1}, number of leaves plant^{-1} of field pea.

Treatments	Plant height (cm)			No. of leaves plant^{-1}			No. of branches plant^{-1}		
	25 DAS	50 DAS	75 DAS	25 DAS	50 DAS	75 DAS	25 DAS	50 DAS	75 DAS
T1	10.20	23.20	40.23	8.43	13.87	19.13	4.43	7.27	2.33
T2	10.33	25.77	43.03	8.37	14.47	22.10	4.00	7.40	2.90
T3	10.53	24.67	42.23	8.57	12.93	20.50	3.87	7.20	2.87
T4	10.37	23.37	41.87	8.57	13.40	18.33	4.33	7.00	2.17
T5	10.47	23.00	41.07	8.60	13.17	19.27	4.50	6.97	1.97
T6	10.27	23.30	39.80	8.27	13.33	19.47	4.40	6.93	2.43
T7	10.03	21.67	34.47	8.47	11.67	14.83	4.17	6.40	1.93
SEd (±)	0.09	0.41	0.99	0.09	0.41	0.99	0.27	0.50	0.28
CD(0=0.05)	0.19	0.84	2.05	0.19	0.84	2.05	0.55	1.03	0.58

Table 2. Influence of different doses of nitrogen and spacing on dry weight plant^{-1}(g), CGR(g m^{-2} day^{-1}), RGR (g g day^{-1}) of field pea

Treatments	Dry weight plant^{-1}(g)			CGR (g m^{-2} day^{-1})			RGR (g g day^{-1})		
	25 DAS	50 DAS	75 DAS	25 DAS	50 DAS	75 DAS	25 DAS	50 DAS	75 DAS
T1	2.87	13.13	18.40	0.11	0.40	0.21	0.04	0.05	0.02
T2	3.43	13.50	19.20	0.14	0.41	0.23	0.05	0.06	0.03
T3	3.47	12.87	17.03	0.14	0.38	0.17	0.05	0.05	0.02
T4	3.57	12.50	18.37	0.14	0.36	0.22	0.05	0.05	0.02
T5	2.63	12.57	17.27	0.11	0.40	0.19	0.04	0.05	0.02
T6	3.40	12.30	17.70	0.14	0.36	0.22	0.05	0.05	0.02
T7	3.27	11.97	16.60	0.13	0.35	0.19	0.05	0.04	0.01
SEd (±)	0.22	0.28	0.53	0.01	0.01	0.01	0.00	0.00	0.00
CD(0=0.05)	0.47	0.58	1.09	0.02	0.03	0.05	0.01	0.01	0.00

which was statistically significant. The smallest dry weight plant^{-1} was T7 (16.60g), with nitrogen fertilizer increasing the accumulation period and rate. Nitrogen application considerably boosted dry matter production during growth phases, according to (Upadhyay and Singh, 2016) and (Rawat and Singh, 2007). Primary branches, leaf area, fresh and dry weight, nodules, green pods, pod length, and green pod yield were all affected by spacing which are similar to the present findings.

Crop Growth Rate (g m^{-2} day^{-1})

The study analyzed Field Pea crop growth rate at different intervals (0-25, 25-50, and 50-75 DAS). Results showed a marginal decrease in CGR, with maximum CGR in treatment T2 (0.41) at 25-50 DAS and T2 (0.23) at 50-75 DAS. Treatment T7 had the slowest growth rate (0.19). Consistent with the current findings, Rawat and Singh (2007), Dar *et al.* (2011), and Tripathi *et al.* (2013) discovered considerably greater growth metrics with increased nitrogen content.

Relative Growth Rate (g g day^{-1})

The RGR of Field Pea was studied at various intervals, with the maximum RGR recorded in treatment T2 (0.06) at 25-50 DAS. T7 had the lowest relative growth rate (0.04), while T2 (0.03) had the highest RGR at 50-70 DAS intervals and T7 had the lowest relative growth rate (0.01). Islam *et al.*, (2002), Dar *et al.*, 2011), and Upadhyay and Singh (2016) discovered that wider spacing and nitrogen addition considerably increased pea development, validating the current findings.

Conclusion

The effects of optimal planting spacing and nitrogen doses on pea growth and development are positive. The nitrogen dose of 30kg ha^{-1} and plant spacing (35x10) cm had a major impact on plant height, number of leaves, number of branches, dry weight, CGR, and RGR, according to the results of this experiment. Because the results are based on a one-season study (*Rabi* 2022), they may be replicated to confirm the outcomes.

References

Bahadur, V. and Singh, T. 1990. Yield and growth response of garden pea (*pisum sativum)* to nitrogen and phosphorus application. *Ind. J. of Vegetable Sci.* 17(2): 205-209.

Bhopal, S. and Singh, B. 1990. Note on response of garden pea to N and P application in *North Hills. Ind. J. of Hort.* 47(1): 107-108.

Choudhury, B. 1967. *Vegetables.* National Book Trust. India, New Delhi.

Choudhury, S.L., Bhatia, P.C., Sharma, B.M. and Ram, S.C. 1972. When and where do rabi pulse pay more. *Indian Fmg*. 21: 280-291

Dar, I. A., Mir, A.H., Rashid, M. and Jan, N. 2011. Effect of different levels of nitrogen and phosphorus on growth and yield of pea (*Pisum sativum* L.) PU-7. *New Agriculturist.* 22 (2): 199-201

Devi, K.M., Chanu, M.M., Abonmai, T. and Singh, M.S. 2022. Effect of spacing on growth and green pod yield of pea (*Pisum sativum* L. subsp. Hortense) local cultivar Makhyatmubi. *The Pharm. Innov. J.* 11(7): 3183-3186.

Islam, M.S., Rahman, M.A., Salam, M.A., Masum, A.S.M.H. and Rahman, M.H. 2002. Growth and vegetable pod yield of edible podded pea as influenced by sowing time and plant Density. *J. of Biol. Sci.* 2(10): 706-709.

Islam, S., Anda, M.K. and Mukherjee, A.K. 2008. Effect of date of sowing and spacing on growth and yield of rabi pigeon pea (*Cajanus cajan* L. (Millsp.) *Journ. of*

Crop and Weed. 4(1): 7-9

Kumar, V.N. and Pandey, B.K. 2008. Studies on the effect of fertilizer doses and row spacing on growth and yield of chickpea (*Cicer arietinum* L*). Agric. Sci. Digest*. 28(2): 139-140.

Laxim, M.H. 1972. Haricot bean variety and spacing experiment. Annual report Hudaeiba Research Station, Damer, Suden.

Mckay, K., Schatz, B. and Endres, G. 2003. Field pea production. *agresearch.montana.edu.*

Pandey, R., Singh, V.R., Singh, R. and Kumar, Y. 2017. Effect of foliar application of nitrogen on growth and yield of vegetable pea *(Pisum sativum* L.) Cv. Kashi Udai. *J. Pharmacogn and Phytochem.* 6(5): 1500-1502.

Rawat and Singh, D. 2007. Effect of spacing on green pod yield of pea cultivars (*Pisum sativum* Linn.) in rainfed mid hills.

Sammauria, R., Yadav, R.S. and Nagar, K.C. 2009. Performance of cluster bean (*Cyamopsis tetragonoloba*) as influenced by nitrogen and phosphorus fertilization and biofertilizers. *Ind. Journ. of Agron.* 54(3): 319-323.

Shaukat, S.A., Ahmad, Z., Choudhary, Y.A. and Shauka, S.K. 2012. Effect of different sowing dates and row spacing on growth, seed yield and quality of off-season pea (*Pisum sativum* L. Cv. Climax*)* under temperate conditions of Rawalakot Azad Jammu and Kashmir. *J. Agric. Sci.* 1(5): 117-125

Singh, K., Saini, S.S., Yadav, S.K., Singh, H. and Kumar, A. 2001. Effect of irrigation and row spacing on growth and yield of field peas. *Agric. Sci. Digest*. 21(2): 127-128.

Tripathi, L.K., Thomas, T. and Kumar, S. 2013. Impact of nitrogen and phosphorus on growth and yield of chickpea (*Cicer arietinum* L.) *An Asian Journ. of Soil Sci.* 8(2) : 260-263.

Upadhyay, R.G. and Singh, A. 2016. Effect of nitrogen and zinc on nodulation, growth and yield of cowpea (*Vigna unguiculata*). *An int. J.* 39 (1) : 149-159.