The Andhra Agric. J 73 (2): 134-138, 2026
doi :10.61657/aaj.2026.265

Growth and yield of horse gram (*Macrotyloma uniflorum* L.) varieties under varied sowing windows in North Coastal Andhra Pradesh

P Anil, G Jogi Naidu, A Upendra Rao and P Gurumurthy
Department of Agronomy, Acharya N G Ranga Agricultural University,
Agricultural College, Naira-532185 , Andhra Pradesh, India

ABSTRACT

A field experiment entitled "Performance of horse gram varieties at different sowing windows in North Coastal Andhra Pradesh" was conducted during *rabi*, 2025-2026 at Agricultural College Farm, Naira, Andhra Pradesh. The experiment was laid out in a split plot design with four sowing windows *viz*., second fortnight of September (S_1), first fortnight of October (S_2), second fortnight of October (S_3) and first fortnight of November (S_4) as main plot treatments and four varieties *viz*., ATPHG-11 (V_1), CRHG-19 (V_2), CRHG-22 (V_3) and VZM-1 (V_4) as sub plot treatments with three replications. The results revealed that sowing windows and varieties significantly influenced growth, phenological observations, growing degree days (GDD) and seed yield of horse gram. Among the different sowing windows, sowing during the first fortnight of October recorded superior growth performance with higher plant height (76.00 cm), branches plant^{-1} (16.50), nodules plant $^{-1}$ (1.40), dry matter production (3583 kg ha $^{-1}$) and seed yield (1520 kg ha^{-1}). The crop sown during the first fortnight of October (S_2) recorded the highest seed yield, which was 14.63 and 41.13 per cent higher than that obtained under the second fortnight of October (S_3) and the first fortnight of November (S_4), respectively. Early sowing during the second fortnight of September accumulated higher thermal units and required more days for flowering and maturity. Among the varieties, VZM-1 (V_4) recorded superior growth performance with higher plant height (73.15 cm), branches plant^{-1} (16.19), nodules plant^{-1} (1.318), dry matter production (3738 kg ha^{-1}) and seed yield (1586 kg ha^{-1}). The VZM-1 (V_4) registered the highest seed yield and outperformed CRHG-22 (V_3), CRHG-19 (V_2) and ATPHG-11 (V_1) by 16.19, 25.67 and 32.17 per cent, respectively. The interaction effect between sowing windows and varieties was significant. Sowing horse gram during the first fortnight of October and second fortnight of September with variety VZM-1 was found most suitable for North Coastal Andhra Pradesh conditions.

Key Words: *Fortnight, Growth dynamics, Phenological observation and Sowing windows*

Horse gram (*Macrotyloma uniflorum* L.) is an important pulse crop belonging to the family Fabaceae and is widely cultivated under rainfed conditions due to its excellent drought tolerance and ability to grow in poor and marginal soils (Sharma *et al*., 2016). The crop is mainly grown in several states of India including Andhra Pradesh, Karnataka, Tamil Nadu and Odisha, where it plays a vital role in sustainable dryland agriculture (Sahoo and Mohanty, 2020). Horse gram is valued not only for its adaptability to harsh climatic conditions but also for its nutritional richness, being a good source of protein, carbohydrates, minerals and dietary fibre (Yadav *et al*., 2004). As a leguminous crop, it also improves soil fertility through biological nitrogen fixation and serves as an important component in sustainable farming systems (Mishra *et al*., 2017). In India, horse gram is cultivated on about 5.07 lakh hectares with a production of 2.62 lakh tonnes and productivity of 516 kg ha^{-1} (ICAR, IIPR, 2026). In Andhra Pradesh, the crop occupies approximately 0.30–0.35 lakh hectares with an annual production of approximately 0.18–0.22 lakh tonnes and an average productivity of 600–700 kg ha^{-1} (Directorate of Economics and Statistics, 2025). Among the various agronomic factors influencing crop productivity, sowing windows and varietal selection plays a crucial role in determining crop growth, flowering behavior and yield performance. Timely sowing ensures favourable environmental conditions for crop establishment and growth, whereas delayed sowing often exposes the crop to moisture stress and adverse temperature

conditions, resulting in poor growth and reduced productivity (Maruthi *et al.*, 2018). Similarly, improved varieties differ in their growth duration, adaptability and yield potential under varying sowing environments (Kumar *et al*., 2023).

MATERIAL AND METHODS

A field experiment was conducted during *rabi*, 2025-2026 at the Agricultural College Farm, Naira of Acharya N.G. Ranga Agricultural University, Andhra Pradesh, situated at 18.387° N latitude, 83.945° E longitude and at an altitude of 27 m above mean sea level in the North Coastal Andhra Pradesh. The soil of the experimental field was loamy sandy in texture, slightly acidic in reaction (pH 6.54), with low electrical conductivity (0.04 ds m^{-1}), medium organic carbon (0.45%) and low available of nitrogen (220 kg ha^{-1}), medium available of Phosphorus (27. 3 kg ha^{-1}) and potassium (197.5 kg ha^{-1}). During the crop growth period, the weekly mean maximum temperature was 32.1° C and minimum temperature of 14.9° C and with a total rainfall of 376.1 mm received in 18 rainy days. The experiment was laid out in a split plot design with three replications comprising four sowing windows *viz*., second fortnight of September (S_1), first fortnight of October (S_2), second fortnight of October (S_3) and first fortnight of November (S_4) as main plots treatments and four horse gram varieties *viz*., ATPHG-11 (V_1), CRHG-19 (V_2), CRHG-22 (V_3) and VZM-1 (V_4) as subplot treatments. Horse gram was sown at a spacing of 30 cm x 10 cm using a seed rate of 25 kg ha^{-1}. The recommended fertilizer dose of 10:25:20 kg N: P_2O_5: K_2O ha^{-1} was broadcasted uniformly in the form of urea, DAP and MOP before sowing. Standard agronomic practices and plant protection measures were followed uniformly for all treatments during the crop growth period. Observations on plant

Table 1. Effect of sowing windows and varieties on growth parameters and seed yield of horse gram at harvest stage

Treatment		Plant height (cm)	Number of branches plant-1	Number of nodules $plant^{-1}$	Dry matter production (kg ha-1)	Seed yield (kg ha-1)
Sowing windows (S)						
S_1: September 2nd		69.2	15.29	1.1	3351	1490
S_2: October 1st FN		76	16.5	1.4	3583	1520
S_3: October 2nd FN		62.5	13.19	0.95	3019	1326
S_4: November 1st		55.8	12	0.8	2549	1077
S. Em(±)		1.92	0.34	0.03	77.5	35.5
CD (*p=0.05*)		6.64	1.18	0.1	268	123
CV (%)		10	8.3	9.4	8.6	9.1
Varieties (V)						
V_1: ATPHG 11		58.19	12.28	0.859	2700	1200
V_2: CRHG 19		63.51	13.54	0.959	2903	1262
V_3: CRHG 22		68.65	14.96	1.114	3161	1365
V_4: VZM 1		73.15	16.19	1.318	3738	1586
S. Em(±)		1.79	0.4	0.03	81.8	25.73
CD (*p=0.05*)		5.25	1.16	0.09	239	75.1
CV (%)		9.5	9.7	9.7	9	6.6
Interaction						
S x V	S. Em(±)	3.66	0.77	0.06	162	57
	CD (*p=0.05*)	NS	NS	NS	472	166
V x S	S. Em(±)	3.84	0.8	0.06	164	51.5
	CD (*p=0.05*)	NS	NS	NS	478	150

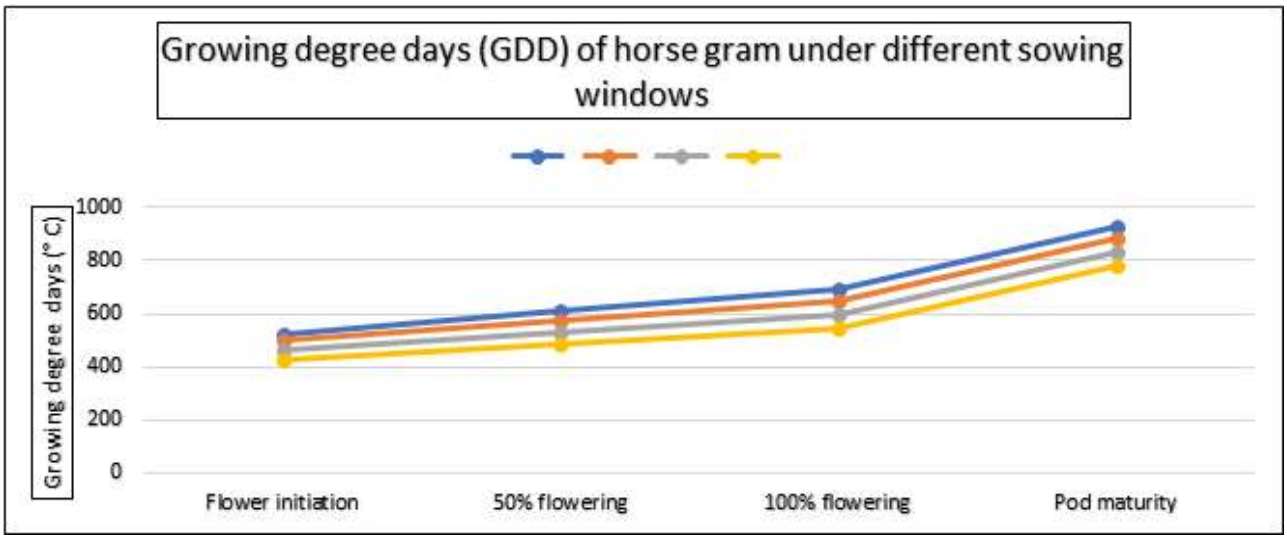


Fig 1. Growing Degree Days (GDD) accumulated at different phenological stages of horse gram under varying sowing windows

height, number of branches plant^{-1}, nodules plant^{-1}, dry matter production, days to 50 per cent flowering growing degree days and days to maturity and seed yield were recorded at different growth stages by following standard procedures. The experimental data was statistically analyzed by the method of analysis of variance (ANOVA) as described by Panse and Sukhatme (1985) and treatment differences were tested at 5 per cent level of significance.

RESULTS AND DISCUSSION

Different sowing windows and varieties had a significant influence on the growth, phenological behavior, growing degree days (GDD) and seed yield of horse gram under North Coastal Andhra Pradesh conditions (Table 1). Among the sowing windows, the crop sown during first fortnight of October (S_2) consistently recorded superior growth performance over the other sowing windows. The first fortnight of October (S_2) sowing registered significantly higher plant height (76.00 cm), number of branches plant^{-1} (16.50), nodules plant $^{-1}$ (1.40) and dry matter production (3583 kg ha^{-1}) at harvest followed by second fortnight of September (S_1) and second fortnight of October (S_3). The better growth observed under first fortnight of October (S_2) sowing window might be due to favourable environmental conditions, optimum soil moisture availability and efficient nutrient uptake throughout the crop growth period. Among the varieties, VZM-1 (V_4) recorded superior growth performance with higher plant height (73.15 cm), branches plant^{-1} (16.19), nodules plant^{-1} (1.318), dry matter production (3738 kg ha^{-1}). In contrast, sowing during the first fortnight of November (S_4) resulted in comparatively poor crop growth because of shortened crop duration and exposure to unfavorable weather conditions during critical stages of crop development. These findings are in conformity with the reports of Vijayakumar *et al.* (2025).

Phenological observations revealed that sowing time significantly influenced flowering and maturity behavior of horse gram. The crop sown during the second fortnight of September (S_1) took more days to attain 50 per cent flowering (49.37 days) and maturity (99.26 days), whereas delayed sowing accelerated crop development and reduced crop duration (Fig.2). Among the varieties, VZM-1 (V_4) accumulated higher thermal units with a total GDD of 1085 under second fortnight of September sowing (S_1), followed by CRHG-22 (V_3), indicating its better utilization of prevailing temperature conditions and relatively longer growth duration. Delayed sowing during the first fortnight of November (S_4) recorded lower GDD values across all varieties due to accelerated phenological development under temperature stress. The GDD under timely sowing contributed to prolonged vegetative growth, better reproductive development and improved crop performance (Fig.1). These findings are in close agreement with earlier reports by Radhod *et al*. (2024), Dubey *et al*. (2024).

Seed yield was significantly influenced by sowing windows. The crop sown during first fortnight of October (S_2) recorded the highest seed yield and was found to be on par with second fortnight of September (S_1). However, both sowing windows were significantly superior to second fortnight of October (S_3) and first fortnight of November (S_4), with the latter recording the lowest seed yield. Among the sowing windows, the crop sown during the first fortnight of October (S_2) recorded the highest seed yield, which was 14.63 and 41.13 per cent higher than that obtained under the second fortnight of October (S_3) and the first fortnight of November (S_4), respectively. The higher yield under first fortnight of October (S_2) and second fortnight of September (S_3) may be attributed to favourable environmental conditions that promoted better crop growth, assimilate production and partitioning towards reproductive sinks. In contrast, delayed sowing during second fortnight of October (S_3) and first fortnight of November (S_4) exposed the crop to less favourable conditions during critical growth stages, resulting in reduced yield. Similar findings were reported by Bhasme et al. (2025), Kumar et al. (2024) and Sandhu and Singh (2020).

With respect to varieties, significant differences were observed in seed yield. VZM-1 (V_4) registered the highest seed yield and outperformed CRHG-22 (V_3), CRHG-19 (V_2) and ATPHG-11 (V_1) by 16.19, 25.67 and 32.17 per cent, respectively. Whereas the lowest seed yield was recorded with ATPHG-11 (V_1). The higher seed yield of VZM-1 (V_4) might be attributed to its better growth performance, efficient assimilate translocation and stronger sink capacity. In addition, VZM-1 (V_4) might have maintained higher photosynthetic efficiency and better canopy development, which ensured a continuous supply of assimilates during the reproductive phase. Its superior partitioning efficiency may have also contributed to the effective conversion of biomass into economic yield. Similar findings were reported by Jadhav *et al.* (2025), Gupta *et al*. (2024) and Kumar *et al.* (2023), who observed significant varietal differences in seed yield due to better growth attributes and efficient assimilate partitioning. The interaction effect between sowing windows and varieties was significant for seed yield, indicating differential varietal response under different sowing environments.

Among the treatment combinations, the first fortnight of October sowing with VZM-1 ($S_2 \times V_4$) recorded the highest seed yield and was found to be on par with the second fortnight of September sowing with VZM-1 ($S_1 \times V_4$). In contrast, the delayed sowing combinations, particularly the first fortnight of November sowing with ATPHG-11 (S,, × V), CRHG-19 ($S_4 \times V_1$) and CRHG-22 ($S_4 \times V_2$), recorded comparatively lower seed yields. Overall, the results indicated that sowing horse gram during the first fortnight of October with VZM-1 (V_4) was the most productive combination for achieving higher growth, biomass accumulation and seed yield under the North Coastal Andhra Pradesh conditions.

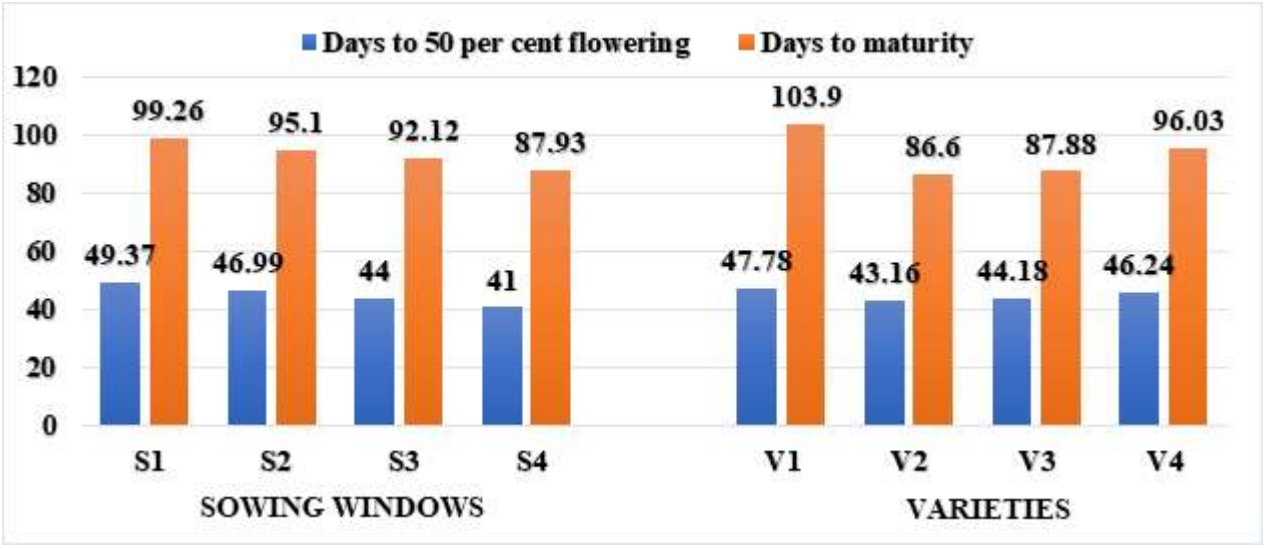


Fig.2. Effect of sowing dates and varieties on flowering and maturity duration in horse gram

CONCLUSION

Sowing during the first fortnight of October and second fortnight of September resulted in superior growth and higher seed yield of horse gram compared to the other sowing windows. Among the varieties, VZM-1 exhibited better growth, thermal utilization and productivity. Therefore, sowing horse gram during the first fortnight of October with VZM-1 was found to be the most suitable option for achieving higher productivity under the agro-climatic conditions of North Coastal Andhra Pradesh.

LITERATURE CITED

Bhasme R A, Jiotode D J, Pagar P C, Lidbe T M, Futane R D and Parkhi P S 2025. Response of black gram cultivar on yield, economics and heat unit under different sowing windows. *International Journal of Advanced Biochemistry Research. 9* (7): 1528-1530.

Directorate of Economics and Statistics 2025. *Agricultural statistics at a glance*. Government of Andhra Pradesh.

Dubey A K, Rawat A K, Sahu R and Bagri U 2024. Heat unit requirements of chickpea cultivars under different sowing environment of Kymore Plateau and Satpura Hills Zone of M.P. *International Journal of Research in Agronomy.* 7 (3): 170–173.

Gupta V, Shrivastava G K, Yadav R, Deewan S K, Krishna and Ekka S 2024. Effect of date of sowing and genotypes on productivity and profitability of urdbean (*Vigna mungo* L.). *International Journal of Research in Agronomy. 7* (9): 341-347.

Indian Institute of Pulses Research 2026. *Horse gram (Macrotyloma uniflorum L. Verdc.)*. Indian Council of Agricultural Research. https://www.icar-iipr.org.in/horsegram

Jadhav A N, Patil N P and Sarwar I 2025. Response of mungbean (*Vigna radiata* L. Wilczek) varieties to different sowing windows. *International Journal of Research in Agronomy.* 8 (1): 1–4.

Kumar K, Ghiyal V, Majoka M, Kumar V, Singh D and Arya R K 2024. Effect of different dates of sowing on growth and yield of cowpea in view of climate change. *Forage Research. 49* (4): 430-433.

Kumar R, Naidu J and Reddy P 2023. Performance of horse gram varieties under varying sowing environments. *Legume Research.* 46 (5): 621–626.

Maruthi V, Reddy M and Kumar N 2018. Effect of sowing time on productivity of horse gram under rainfed conditions. *International Journal of Current Microbiology and Applied Sciences.* 7 (6): 2245–2251.

Mishra S, Verma A and Singh R 2017. Role of legumes in soil fertility improvement through biological nitrogen fixation. *Agricultural Reviews.* 38(1): 45–52.

Panse V G and Sukhatme P V 1985. *Statistical methods for agricultural workers.* 4th edition. Indian Council of Agricultural Research, New Delhi.

Rathod A S, Jadhav J D, Londhe V M, Jadhav V T, Bagade S V, Sthool V A, Khobragade A M and Kadam Y E 2024. Performance of chickpea (*Cicer arietinum* L.) cultivars under different sowing window over scarcity zone of Maharashtra. *International Journal of Research in Agronomy.* 7 (2): 37–41.

Sahoo S C and Mohanty S 2020. Performance of horse gram under dryland farming systems. *Journal of Crop and Weed.* 16 (2): 120–124.

Kumar K, Ghiyal V, Majoka M, Kumar V, Singh D and Arya R K 2024. Effect of different dates of sowing on growth and yield of cowpea in view of climate change. *Forage Research. 49* (4): 430-433.

Sharma R, Singh A and Patel N 2016. Drought tolerance and adaptability of horse gram under marginal environments. *Indian Journal of Dryland Agricultural Research and Development.* 31 (1): 12–16.

Vijayakumar M, Prabu P C, Sivakumar R, Thiyagarajan R and Arunkumar V 2025. Optimizing sowing time and method for enhancing horse gram productivity in rainfed ecosystems. *Plant Science Today.* 12 (3): 1–5.

Yadav S, Yadav R and Kumar A 2004. Nutritional composition and medicinal value of horse gram. *Indian Food Industry.* 23 (4): 18–22.

Received on 14.04.2026 and Accepted on 18.05.2026