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EFFECT OF ORGANIC MANURES AND NANO FERTILIZERS ON GROWTH OF CHINA ASTER (*Callistephus chinensis* L. Nees.) CV. PHULE GANESH VIOLET

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ABSTRACT

The present study entitled "Effect of organic manures and nano fertilizers on growth of China aster [*Callistephus chinensis* (L.) Nees.] cv. Phule Ganesh Violet" was conducted during the year 2025–2026 at Department of Floriculture and Landscaping, on the Research cum Instructional Farm of Krantikari Debridhur College of Horticulture and Research Station Jagdalpur. Mahatma Gandhi Udhyanikee Evam Vanikee Vishwavidyalaya, Durg (C.G.). The study involved 8 treatments with 3 replications. The study focused on assessing growth parameters, flower parameters and quality parameters of China aster at Bastar region. The evaluated China aster treatments exhibited significant variability in growth parameters. The maximum plant height in T_1(13.95) at 30 DAT and in T_7 (46.48cm and 72.24 cm) at 60 and 90 DAT respectively, number of leaves plant^{-1} in T_1(17.45) at 30 DAT and in T_7 (52.93 and 118.28) at 60 and 90 DAT respectively, number of branches plant^{-1} in T_1 (4.03) at 30 DAT and in T_7 (7.92 and 19.41) at 60 and 90 DAT respectively and plant spread North–South direction (34.48 cm) and East–West direction, the highest plant spread (31.36 cm) in T_7 whereas in T_0 minimum values were recorded for all observation.

***Keyword*:** Integrated nutrient management, organic manures, nano fertilizers, growth parameters.

Introduction

China aster (*Callistephus chinensis* (L.) Nees), a member of the Asteraceae family, is an important commercial ornamental crop widely cultivated in India and other parts of the world. Native to China, it was introduced to Europe around 1731 A.D. and later spread to several tropical and temperate regions (Desai, 1967). The genus *Callistephus* is monotypic, comprising a single species, *C. chinensis*, which was initially described as *Aster chinensis* by Linnaeus and later reclassified by Nees (Chaitra and Patil, 2006). Owing to its wide range of attractive colours, diverse flower forms, profuse flowering habit and good vase life, China aster is extensively grown for both loose and cut flower purposes (Janakiram, 1997).

In India, floriculture has emerged as a significant horticultural enterprise contributing to economic growth and rural livelihoods. China aster is commercially cultivated by small and marginal farmers in states such as Karnataka, Tamil Nadu, Maharashtra, Andhra Pradesh and West Bengal due to its adaptability and high market demand (Anonymous, 2024–25). Its versatility as a bedding, pot and border plant further enhances its ornamental value.

Recent advances in nutrient management, particularly the use of nano-fertilizers, have shown promise in improving nutrient use efficiency and crop productivity. Nano-fertilizers, including nano urea and nano DAP, provide controlled and targeted nutrient delivery, thereby reducing fertilizer requirement and enhancing crop yield (DeRosa *et al*., 2010; Kantwa and Yadav, 2022; Talboys *et al*., 2020). Along with this, organic manures such as vermicompost and farmyard manure play a vital role in improving soil health, microbial activity and nutrient availability, contributing to sustainable crop production (Kaith and Singh, 1997; Reddy and Reddy, 2004; Takka and Dutta, 2006).

Material and Method

Experimental site

The experiment on China Aster [*Callistephus chinensis* (L.) Ness.] was carried out at the Research-cum-instructional farm Jagdalpur, Bastar District during the 2025–26 season in a Randomized Block Design (RBD) with 8 treatments and 3 replications under different combination of organic manures and nano fertilizers which contains. The details of the treatment are T_0 : Control, T_1 : Integrated Organic Mix (50% FYM @ 5 t ha^{-1} + 50% VC @ 3 t ha^{-1}), T_2 : Nano Mix (Nano Urea @ 2ml/lit + Nano DAP@ 2.5ml/l), T_3: 50% FYM @ 5t/ha + Nano Urea (2ml/l), T_4 : 50% VC @ 3t/ha + Nano Urea (2ml/l), T_5: 50% FYM @ 5t/ha + Nano DAP (2.5ml/l), T_6 : 50% VC @ 3t/ha + Nano DAP (2.5ml/l), T_7: Integrated Organic Mix (25%of FYM + 25% of VC) + Nano Mix (Nano Urea[1ml/l] + Nano DAP[1.25ml/l]). The experimental data recorded for various vegetative growth parameters were subjected to statistical analysis using analysis of variance (ANOVA). The significance of differences among treatments was tested using the F-test, and interpretations were made at the 5 percent level of probability, following the procedure described by [Gomez and Gomez (1984)].

Result and Discussion

Plant height (cm)

Table 1.1 and Fig. 1.1 indicates that at 30 DAT, the maximum plant height (13.95 cm) was recorded in T_1 [Integrated Organic Mix (50% FYM @ 5 t ha^{-1} + 50% VC @ 3 t ha^{-1})], which was significantly at par with T_7. The minimum plant height was recorded in control T0 (8.35 cm). At 60 DAT, plant height increased progressively in all treatments. The tallest plants were observed under T_7 [Integrated Organic Mix (25% FYM + 25% VC) + Nano Mix (Nano urea @ 1 ml l^{-1} + Nano DAP @ 1.25 ml l^{-1})], which recorded 46.48 cm plant height. This was statistically at par with T_4. The control recorded the lowest plant height (19.05 cm). Similarly, at 90 DAT, the maximum plant height (72.24 cm) was recorded in T_7 [Integrated Organic Mix (25% FYM + 25% VC) + Nano Mix (Nano urea @ 1 ml l^{-1} + Nano DAP @ 1.25 ml l^{-1})]. This was statistically on at par with T_4 and T_6. The minimum plant height (32.43 cm) was recorded under T_0 control.

No. of leaves plant^{-1}

Table 1.2 and Fig 1.2 indicates that at 30 DAT, the maximum number of leaves plant^{-1} (17.45) was recorded under T_1 [Integrated Organic Mix (50% FYM @ 5 t ha^{-1} + 50% VC @ 3 t ha^{-1})], which was on at par with T_7, whereas the minimum number of leaves (5.65) was observed in the control (T_0). At 60 DAT, treatment T_7 [Integrated Organic Mix (25% FYM + 25% VC) + Nano Mix (Nano urea @ 1 ml l^{-1} + Nano DAP @ 1.25 ml l^{-1})] recorded the highest number of leaves plant^{-1} (52.93), which was at par with T_4 and T_6. The lowest number of leaves (30.54) was registered under control. At 90 DAT, the significantly highest number of leaves plant^{-1} (118.28) was observed in T_7 [Integrated Organic Mix (25% FYM + 25% VC) + Nano Mix (Nano urea @ 1 ml l^{-1} + Nano DAP @ 1.25 ml l^{-1})], which was on at par with T_4. The control treatment recorded the minimum number of leaves (77.28).

No. of branches plant^{-1}

Table 1.3 and Fig. 1.3 revealed that at 30 DAT, the maximum number of branches was observed in T_1 [Integrated Organic Mix (50% FYM @ 5 t ha^{-1} + 50% VC @ 3 t ha^{-1})], (4.03). Treatments T_7 recorded were statistically at par. The minimum number of branches was recorded in T_0 (Control) (0.89). At 60 DAT, the highest number of branches was recorded in T_7 [Integrated Organic Mix (25% FYM + 25% VC) + Nano Mix (Nano urea @ 1 ml l^{-1} + Nano DAP @ 1.25 ml l^{-1})] (13.97). T_4 and T_6 were found to be statistically at par with T_7. The lowest number of branches was again observed in T_0 (7.92 At 90 DAT, T_7 [Integrated Organic Mix (25% FYM + 25% VC) + Nano Mix (Nano urea @ 1 ml l^{-1} + Nano DAP @ 1.25 ml l^{-1})] recorded the maximum number of branches (19.41), T_4, T_6, T_3 and T_5 which were statistically at par. The minimum inT_0 control (12.70).

Plant spread (cm)

As shown in Table 1.4 and Fig. 1.4, the maximum plant spread (34.48 cm) was recorded in T_7 [Integrated Organic Mix (25% FYM + 25% VC) + Nano Mix (Nano Urea 1 ml L^{-1} + Nano DAP 1.25 ml L^{-1})]. T_4 was found to be statistically at par with T_7. The minimum plant spread (20.35 cm) was recorded under T_0 Control. Similarly, in the East–West direction, the highest plant spread (31.36 cm) was recorded in T_7 [Integrated Organic Mix (25% FYM + 25% VC) + Nano Mix (Nano urea @ 1 ml l^{-1} + Nano DAP @ 1.25 ml l^{-1})], T_4, T_6 and T_3 which remained statistically at par. The lowest plant spread (22.01 cm) recorded in T_0 control. integrated effect of FYM and vermicompost in improving soil physical properties, microbial activity, and nutrient retention, coupled with the rapid absorption and higher nutrient use efficiency of nano fertilizers. The lowest number of branches observed in the control treatment due to poor nutrient availability and lack of balanced nutrition. The findings were closely aligned with Venkatesh *et al*. (2022) in marigold, Chaitra (2006) in China aster, Mallikarjuna (2012) in China aster and Singh *et al.* (2024) in China aster.

Table 1.1 : Effect of INM in China Aster on Plant height (cm)

Treatment		Plant Height (cm)		
		30DAT	**60 DAT**	**90DAT**
T_0	Control	8.35	19.05	32.43
T_1	[Integrated Organic Mix (50 % FYM @5t/ha+ 50% of VC @3t/ha)	13.95	23.88	39.80
T_2	Nano Mix (Nano Urea @ 2ml/lit + Nano DAP@ 2.5ml/l)	8.48	26.31	42.35
T_3	50% FYM @ 5t/ha + Nano Urea (2ml/l)	9.94	36.09	57.21
T_4	50% VC @ 3t/ha + Nano Urea (2ml/l)]	11.08	43.39	68.65
T_5	50% FYM @ 5t/ha + Nano DAP (2.5ml/l)	10.04	33.56	51.91
T_6	50% VC @ 3t/ha + Nano DAP (2.5ml/l)	11.21	39.32	62.70
T_7	Integrated Organic Mix (25%of FYM + 25% of VC) + Nano Mix (Nano Urea[1ml/l] + Nano DAP[1.25ml/l])	12.62	46.48	72.24
C.D. at 5%		**1.83**	**5.20**	**10.11**
S.E. m ±		**0.60**	**1.70**	**3.30**
C.V. (%)		**9.64**	**8.78**	**10.70**

Table 1.2 : Effect of INM in China Aster on No. of leaves plant^{-1}

Treatment		No. of Leaves Plant^{-1}		
		30DAT	**60 DAT**	**90DAT**
T_0	Control	5.65	30.54	77.28
T_1	[Integrated Organic Mix (50 % FYM @5t/ha+ 50% of VC @3t/ha)	17.45	34.18	83.03
T_2	Nano Mix (Nano Urea @ 2ml/lit + Nano DAP@ 2.5ml/l)	5.94	39.72	92.95
T_3	50% FYM @ 5t/ha + Nano Urea (2ml/l)	7.07	43.37	98.04
T_4	50% VC @ 3t/ha + Nano Urea (2ml/l)]	9.35	49.41	103.25
T_5	50% FYM @ 5t/ha + Nano DAP (2.5ml/l)	7.97	40.57	95.61
T_6	50% VC @ 3t/ha + Nano DAP (2.5ml/l)	14.88	47.54	101.90
T_7	Integrated Organic Mix (25%of FYM + 25% of VC) + Nano Mix (Nano Urea[1ml/l] + Nano DAP[1.25ml/l])	16.38	52.93	118.28
C.D. at 5%		**1.47**	**5.52**	**15.91**
S.E. m ±		**0.48**	**1.80**	**5.20**
C.V. (%)		**7.85**	**7.38**	**9.35**

Table 1.3 : Effect of INM in China Aster on No. of branches plant^{-1}

Treatment		No. of Branches Plant^{-1}		
		30DAT	**60 DAT**	**90DAT**
T_0	Control	0.89	7.92	12.70
T_1	[Integrated Organic Mix (50 % FYM @5t/ha+ 50% of VC @3t/ha)	4.03	10.12	13.15
T_2	Nano Mix (Nano Urea @ 2ml/lit + Nano DAP@ 2.5ml/l)	0.92	10.67	14.79
T_3	50% FYM @ 5t/ha + Nano Urea (2ml/l)	1.38	11.74	17.37
T_4	50% VC @ 3t/ha + Nano Urea (2ml/l)]	1.83	12.92	18.73
T_5	50% FYM @ 5t/ha + Nano DAP (2.5ml/l)	1.52	11.34	16.80
T_6	50% VC @ 3t/ha + Nano DAP (2.5ml/l)	2.92	12.17	17.74
T_7	Integrated Organic Mix (25%of FYM + 25% of VC) + Nano Mix (Nano Urea[1ml/l] + Nano DAP[1.25ml/l])	3.29	13.97	19.41
C.D. at 5%		**0.43**	**1.94**	**3.15**
S.E. m ±		**0.14**	**0.63**	**1.03**
C.V. (%)		**11.54**	**9.68**	**10.90**

Table 1.4 : Effect of INM of China Aster (cm) on Plant spread (cm)

Treatment		Plant spread (cm)	
		N-S	E-W
T_0	Control	20.35	22.01
T_1	[Integrated Organic Mix (50 % FYM @5t/ha+ 50% of VC @3t/ha)	22.92	22.57
T_2	Nano Mix (Nano Urea @ 2ml/lit + Nano DAP@ 2.5ml/l)	26.03	23.09
T_3	50% FYM @ 5t/ha + Nano Urea (2ml/l)	30.50	25.05
T_4	50% VC @ 3t/ha + Nano Urea (2ml/l)]	32.55	28.22
T_5	50% FYM @ 5t/ha + Nano DAP (2.5ml/l)	28.44	23.48
T_6	50% VC @ 3t/ha + Nano DAP (2.5ml/l)	31.36	25.65
T_7	Integrated Organic Mix (25%of FYM + 25% of VC) + Nano Mix (Nano Urea[1ml/l] + Nano DAP[1.25ml/l])	34.48	31.36
C.D. at 5%		**4.29**	**4.23**
S.E. m ±		**1.40**	**1.38**
C.V. (%)		**8.56**	**9.51**

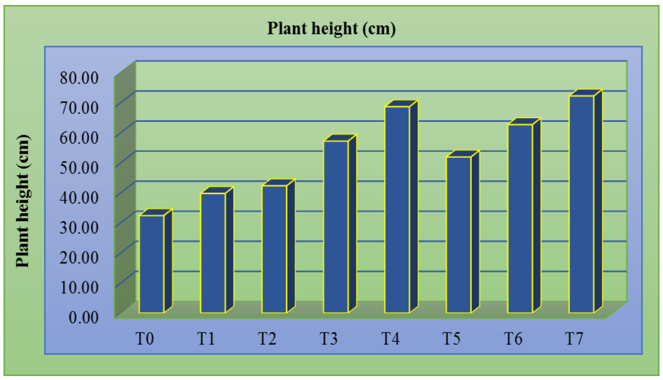

Fig. 1.1 : Effect of INM in China Aster on Plant height (cm)

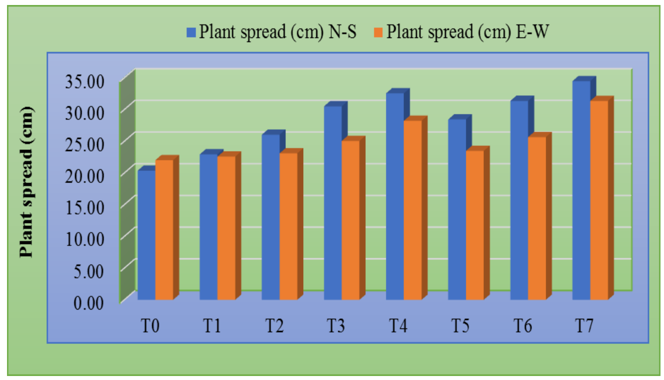

Fig. 1.4 : Effect of INM of China Aster on Plant spread (cm)

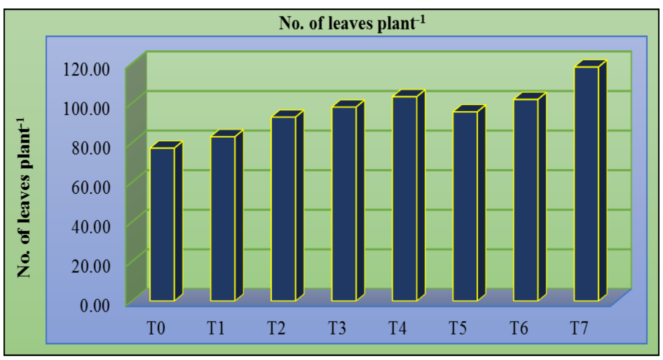

Fig. 1.2 : Effect of INM in China Aster on No. of leaves plant^{-1}

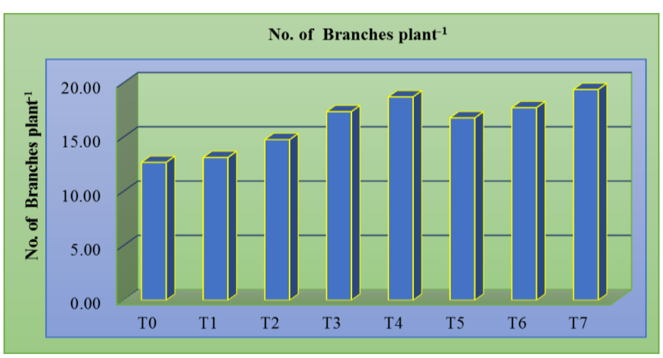

Fig 1.3 : Effect of INM in China Aster on No. of branches plant^{-1}

Conclusion

The investigation revealed Among the different treatments, T_7 [Integrated Organic Mix (25% FYM + 25% Vermicompost) + Nano Mix (Nano urea @ 1 ml l^{-1} + Nano DAP @ 1.25 ml l^{-1})] proved to be the most effective treatment. This treatment recorded maximum plant height, higher number of leaves and branches, and greater plant spread, indicating enhanced vegetative growth.

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