INTERNATIONAL JOURNAL OF APPLIED BIOLOGY AND PHARMACEUTICAL TECHNOLOGY

Volume: 3: Issue-1: Jan - Mar-2012 *ISSN 0976-4550*

Accepted: Oct-2011 *Research Article*

EFFECT OF ORGANIC AND INORGANIC FERTILIZERS ON PLANT HEIGHT, SPREAD AND FLOWER DIAMETER OF GAILLARDIA (GAILLARDIA PULCHELLA)

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ABSTRACT: An experiment was conducted to study the effect of organic and inorganic fertilizers on plant height, plant spread and flower diameter of Gaillardia (Gaillardia pulchella). In Gaillardia the plant maximum height was recorded in the plot treated with 100 per cent recommended dose of NPK + press mud at 10 tones ha^{-1} followed by 75 per cent recommended dose of NPK + press mud at 10 t ha^{-1} at 45 days and 75 per cent recommended dose of NPK + press mud at 5 tones ha^{-1} at 15, 30 and 60 days. Highest plant spread was obtained at 30 and 45 days after planting in the treatments which involved 100 per cent recommended dose of NPK + press mud at 10 t ha^{-1} and at 60 days no significant differences were recorded. The combination of recommended dose of NPK + press mud at 10 t ha^{-1} produced maximum diameter of flower.

Key Words: Gaillardia, RDF, pressmud, vermicompost, FYM

INTRODUCTION

Gaillardia (Gaillardia pulchella), a member of the family Asteraceae, is native of Central and Western United States. The generic name Gaillardia stands in honor of M. Gaillard, a French patron of botany (Baily, 1947). It is popularly known as Blanket flower and is one of the hardiest annuals which are grown in the garden under varied soil and climatic conditions. The plant produces soft and hairy alternate leaves which are more or less serrated. The flowers are borne on long thin wire like stems in solitary, well above the sprawling branches underneath, with usually showy heads (4-6 cm diameter). The ray-florets are yellow, red and mixed coloured with 3 to 5 toothed; while the disc-florets are yellow purple and fertile; bracts in 2 or 3 series and ligules 3- toothed, giving a fringed appearance to the flower.

It is being grown as one of the important commercial flower crops in various parts of the India. After the advent of 'green revolution', continuous use of fertilizers has led to increase in crop production. But, indiscriminate use of fertilizers has some limitations as it affects the environment, the soil health and fauna. Therefore, now there is a greater awareness worldwide, about the alternative or natural or organic agricultural practice in view of energy shortage, food safety and environmental concern.

In landscaping, they are useful for filling up, any up and odd corners, large open areas or wide perennial or herbaceous borders. They are also used for interior decorations viz., vases and bouquets apart from religious purposes as loose flowers. Besides its utility in landscape and cut flower, gaillardia is useful in reducing erosion in coastal dune areas (Craig, 1977).

In view of its importance and ease of cultivation, it is necessary to generate scientific information for the benefit of farming community. Nutritional management of Gaillardia crop is one of the important factors that can manifest the performance of the crop. Due to energy crisis, high cost of chemical fertilizers and poor purchasing power of marginal and small farmers, it is imperative to develop strategies for using organic manures or wastes to their maximum potential with proper technology to meet the shortage of fertilizers for improving the soil fertility. Integrated nutrient management aims at getting higher yield, Quality and at the same time safeguards the interests of farmers and environmental concerns.

But there is lack of information regarding its nutritional requirements. Thus it is imperative to workout specific combination of nutrients, which may enable the gaillardia growers to harvest the maximum possible economic yields. Hence the present investigation was undertaken to analyze the effect of combination of organic and inorganic nutrients on its growth at open field. Hence, the present study was undertaken with the objectives to study the effect of organic and inorganic fertilizers on growth and flower yield of gaillardia.

MATERIAL AND METHODS

An experiment was conducted to study "effect of organic and inorganic fertilizers on plant height, plant spread and flower diameter of Gaillardia (Gaillardia pulchella)". The field experiments were conducted during the rabi season. Agro climatically the station is situated in the Southern dry zone and is located at 11^0 30' N latitude at 76^0 05' E longitudes and at an altitude of 561.6 m above mean sea level. The soil of the experiment was red sandy loam with pH of 7.7 and EC of 0.06 dsm^{-1}. The soil had low available N (110 kg ha^{-1}) and P (31.36 kg ha^{-1}) but high in available K (319 kg ha^{-1}). Organic carbon content of the soil was 0.4 to 0.5 per cent. The experiment was laid out in randomized complete block design with nine treatments and three replications. The treatment combinations are given below,

T1: Control - recommended dose of NPK + FYM @ 15 t/ha

T2: 75 per cent of recommended dose of NPK + FYM @ 15 t/ha

T3: 75 per cent of recommended dose of NPK + FYM @ 10 t/ha

T4: Recommended dose of NPK + press mud @ 10 t/ha

T5: 75 per cent of recommended dose of NPK + press mud @ 10 t/ha

T6: 75 per cent of recommended dose of NPK + press mud @ 5 t/ha

T7: Recommended dose of NPK + vermicompost @ 5 t/ha

T8: 75 per cent of recommended dose of NPK + vermicompost @ 5 t/ha

T9: 75 per cent of recommended dose of NPK + vermicompost @ 2.5t/ha

Recommended dose – 150: 80: 60 kg NPK/ha

The variety used in the experiment was D.G.S-1 (Dharwad Gailardia Selection-1) and plants were planted at the spacing of 45 cm x 30 cm with a gross plot size of 1.8 m x 1.5 m and net plot size of 1.35 m x 1.2 m from the plot 20 plants of equal growth were selected for the experiment. Fertilizers were supplied in the form of urea, single super phosphate and muriate of potash.

RESULT AND DISCUSSION

The data in table 1, represents the effect of organic and inorganic fertilizers on the plant height, which was significantly influenced by various treatments. The plant height was significantly influenced by various treatments. The treatment T4 (100% recommended NPK + pressmud (PM) at 10 t ha^{-1}) recorded maximum plant height (3.9,30.0,59.7 and 71.2 cm at 15, 30, 45 and 60 days after planting, respectively), at 15 and 30 days after transplanting, The least plant height was recorded in the treatment T3 (75% recommended NPK + FYM at 10 t ha^{-1}), (2.16 and 28.66 cm respectively) & At 45 & 60 days after transplanting the least plant height recorded in T2 (75% recommended NPK + FYM at 15 t ha^{-1}). (37.66 and 62.33 cm respectively) (Table 1).

Table1. Plant height (cm) as influenced by organic manures and inorganic fertilizers in gaillardia

Treatment	Plant height (cm)			
	15 DATP	30 DATP	45 DATP	60 DATP
T1 – RD of NPK+FYM @ 15 t /ha	3.13	29.26	42.66	65.66
T2 – 75% RD of NPK + FYM @ 15t/ha	2.60	28.66	37.66	62.33
T3 - 75% RD of NPK + FYM @ 10 t/ha	2.16	28.66	41.66	64.33
T4 - RD of NPK + Pressmud @ 10t/ha	3.86	30.03	59.66	71.16
T5 - 75% RD of NPK + Pressmud @ 10t/ha	3.66	29.40	59.33	70.40
T6- 75% RD of NPK + Pressmud @ 5t/ha	3.66	29.90	55.33	70.66
T7- RD of NPK + Vermicompost @ 5t/ha	3.53	29.56	50.00	69.00
T8- 75 % RD of NPK + Vermicompost @ 5t/ha	3.46	29.33	46.33	68.66
T9- 75 % RD of NPK + Vermicompost @ 2.5t/ha	3.06	29.06	44.00	68.00
F-test	*	*	*	*
S.Em+	0.14	0.17	1.08	0.79
CD at 5%	0.42	0.51	3.26	2.38

RD: Recommended dose 150: 80: 60 kg NPK / ha

DAT: Days after transplanting

At 30 days after transplanting, highest plant height recorded by T4 was found to be on par with T6, At 45 days after transplanting, highest plant height recorded by T4 was found to be on par with T5 and At 60 days after transplanting, highest plant height recorded by T4 was found to be on par with T5 and T6 (Table 1). Nethra (1996) obtained the tallest China aster plants in the plots which received 10 t of vermicompost and recommended dose of N, P_2O_5 and K_2O. Increase in height of chrysanthemum plants was obtained by Soltanzed et al. (1982) with the application of filtered pressmud media. Increase in height of chrysanthemum plants was obtained by Soltanzed et al. (1982) with the application of filtered pressmud media. The maximum plant height (68.6 cm) was obtained in the pot filled with soil + coco peat, in case of liliums (2005).

It is clear from the increasing trend in height of plants obtained at different days after planting that, nutrients have their positive effect on plant height during most parts of crop growth period. This increase in plant height might be due to macronutrients supplied and availability of micronutrients from the vermicompost or pressmud and its buffering action on soil pH. Besides, adequate sub-soil moisture provided by irrigation at regular intervals and prevalence of moderate temperature during the period of crop growth also might have influenced in obtaining the above result.

Plant spread differed significantly with respect to influence of NPK and organic manures at 30 and 45 days after transplanting (DAT). But at 15 and 60 days after transplanting it showed non significant difference (Table 2). Maximum plant spread (993.3 sq cm & 2036 cm at 30 and 45 DATP, respectively) was recorded with the treatment T4 (100% recommended dose of NPK + pressmud at 10 t ha^{-1}). The minimum plant spread (922 cm^2 and 2005.7 cm^2 at 30 & 45 DAT, respectively) was recorded with the treatment T3 (75% recommended dose of NPK + FYM 10 t ha^{-1}) at stages of growth compared to control T1. At 30 DAT, T4 recorded the highest plant spread which was on par with T5 and At 45 DATP, T4 recorded the highest plant spread which was on par with T6. The results are in conformity with those reported by Sigedar et al. (1991) in calendula, who obtained highest plant spread by the application of recommended N, P_2O_5 and K_2O dosage. But plant spread showed non significant difference between the treatments at 60 days after transplanting. The results are in conformity with those reported by Mokashi (1988), where in gaillardia, the increasing levels of N (180 to 250 kg/ha) and P (80 to 120 kg/ha) did not increase the plant spread.

Table 2. Plant spread (cm^2) as influenced by organic manures and inorganic fertilizers in gaillardia

Treatment	15 DATP	30 DATP	45 DATP	60 DATP
T1 – RD of NPK+FYM @ 15 t /ha	66.33	968.33	2007.33	3506.66
T2 – 75% RD of NPK + FYM @ 15t/ha	83.66	946.00	2008.66	3140.00
T3 - 75% RD of NPK + FYM @ 10 t/ha	71.00	922.00	2005.66	3160.00
T4 - RD of NPK + Pressmud @ 10t/ha	82.66	993.33	2036.00	2586.00
T5 - 75% RD of NPK + Pressmud @ 10t/ha	78.00	986.00	2029.00	3673.33
T6- 75% RD of NPK + Pressmud @ 5t/ha	71.00	972.00	2030.00	3606.66
T7- RD of NPK + Vermicompost @ 5t/ha	66.66	970.66	2022.66	3563.33
T8- 75 % RD of NPK + Vermicompost @ 5t/ha	59.00	966.33	2018.66	3536.66
T9- 75 % RD of NPK + Vermicompost @ 2.5t/ha	71.33	961.00	2004.33	3316.66
F-test	NS	*	*	NS
S.Em+	9.55	8.60	2.83	368.35
CD at 5%	28.63	25.80	8.50	1104.38

RD: Recommended dose 150: 80: 60 kg NPK/ha
DAT: Days after transplanting and ATP: At the time of Transplanting.
* Significant NS: Not significant

Although, plant spread showed significantly increased trend, but less spread in the beginning might be due to insufficient nutrients status of the soil to produce sufficient leaf primordia. However, the treatment which received more nutrients produced more spread. At later stages of crop growth requirement of nutrients applied as well as those released from pressmud and vermicompost, besides the congenial conditions that might have been prevailing at the vicinity of rhizosphere to absorb nutrients, by rendering moderate temperature and pH of soil might have facilitated the more plant spread. But again at later stage plant spread showed decreasing trend since plant turned from vegetative stage to reproductive stage.

Among the different traits of quality, diameter of flower was considered to be most important as it decides the quality of cut flower and loose flower for marketing. Both pressmud and vermicompost along with NPK produced significant results compare to control in gaillardia. The combination of recommended dose of NPK + pressmud at 10 t ha^{-1} produced maximum diameter of flower (Table 3). The results are in accordance with those obtained by Jayanthi and Gowda (1988), in marigold, who recorded higher diameter and yield of flower, when 30 g of N + 40 g of P_2O_5 were applied per sq.m. Kale et al. (1987) reported that the flower diameter of China aster increased significantly when worm-cast was used as a substrate. The significant results obtained in respect to diameter of flower could be due to more influence exerted by the application of vermicompost or pressmud applied in combination with different levels of NPK.

Table 3. Diameter of flower (cm) as influenced by organic manures and inorganic fertilizers in gaillardia

Treatment	Diameter of flower (cm)
T1 – RD of NPK+FYM @ 15 t /ha	5.80
T2 – 75% RD of NPK + FYM @ 15t/ha	5.06
T3 - 75% RD of NPK + FYM @ 10t/ha	4.36
T4 - RD of NPK + Pressmud @ 10t/ha	6.73
T5 - 75% RD of NPK + Pressmud @ 10t/ha	6.43
T6- 75% RD of NPK + Pressmud @ 5t/ha	6.63
T7- RD of NPK + Vermicompost @ 5t/ha	6.00
T8- 75 % RD of NPK + Vermicompost @ 5t/ha	6.16
T9- 75 % RD of NPK + Vermicompost @ 2.5t/ha	5.70
F-test	*
S.Em+	0.17
CD at 5%	0.53

RD: Recommended dose 150: 80: 60 kg NPK / ha

From our observations it is recommended that by applying hundred per cent RDF plus 10 tonnes of pressmud per hectare we can get good vegetative growth with respect to plant height and plant spread and quality flowers.

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