

Original Research Article

Effect of Nitrogen and Phosphorus on Seed Quality and Seed Yield of Gaillardia

S. S. Moon^{*}, M. H. Bhande and R. P. Gajbhiye

Department of Horticulture, College of Agriculture, Nagpur-440 001 (M.S.), India

**Corresponding author*

ABSTRACT

Keywords

Gaillardia,
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An experiment to study the effect of nitrogen and phosphorus on seed quality and seed yield of Gaillardia was carried out at Horticulture section, College of Agriculture, Nagpur during *rabi* season of 2014-2015 with sixteen treatment combinations in factorial randomized block design. The treatments comprised of four different levels of nitrogen viz., 0, 50, 100 and 150 kg ha⁻¹ and four different levels of phosphorus viz., 0, 25, 50 and 75 kg ha⁻¹. The result of present investigation revealed that, application of 150 kg ha⁻¹ nitrogen and 75 kg ha⁻¹ phosphorus produced significantly maximum weight of seeds flower⁻¹, test weight and germination per cent, flowers plant⁻¹ with respect to seed quality parameters and maximum seeds flower⁻¹, seed yield plant⁻¹, seed yield plot⁻¹ and seed yield ha⁻¹ with respect to seed yield parameters. The interaction effect were found non-significant. For these parameters, the best treatment combination was 150 kg nitrogen ha⁻¹ + 75 kg phosphorus ha⁻¹.

Introduction

Floriculture is one of the most important branch of horticulture in aesthetic, social and commercial sense. It has been closely associated with Indian culture from Vedic times. Flowers are one of God's most beautiful boons to humankind that bring joy and happiness to all. The flowers are soul of garden that convey the message of nature to man.

The total area under floriculture crops in India during the year 2013-2014 was estimated to be 242 thousand hectares with the production of 1847 thousand metric tons of loose flowers and 79432 lakh number of cut flowers. India's total export of floricultural products and flowers was costing 455.90 crores during 2013-2014.

(Anon, 2014). Gaillardia is popularly known as blanket flower. It is native of America, especially in the West. The generic name *Gaillardia* was proposed in honour of M. Gaillard, a French patron of botany. It belongs to family Asteraceae and there are 12 species, out of which *G. pulchella* and *G. aristata* are of horticultural importance, being annual and perennial forms, respectively.

The growth and flowering of Gaillardia are greatly influenced by judicious application of nitrogen and phosphorus. Nitrogen is a constituent of enzymes, vitamins and plant hormones result in vigorous vegetative growth of plant hence increase in yield of flowers with better quality. Likewise

phosphorous is needed for normal growth and development of the plant due to its vital role in chlorophyll synthesis and metabolic processes of the plant. The response of nitrogen and phosphorus are mostly remunerative but it's imperative to find out the optimum dose of nitrogen which can give better growth, flower and seed yield.

Materials and Methods

An investigation entitled, "effect of nitrogen and phosphorus on seed quality and seed yield of *Gaillardia*" was carried out at the farm of Horticulture section, College of Agriculture, Nagpur during *rabi* season 2014-15. The experiment was laid out in in Factorial Randomized Block Design with 16 treatment combinations.

Treatment combinations comprised with four different levels of nitrogen (0, 100, 150 and 200 kg ha⁻¹) and four different level of phosphorus (0, 50, 75 and 100 kg ha⁻¹).

The uniform size and healthy 45 days old seedlings were selected for transplanting at 60 x 45 cm spacing. Half dose of nitrogen and full dose of phosphorus were applied as a basal dose at the time of transplanting and remaining half dose of nitrogen was given one month after transplanting. Regarding application of potash, common dose of potash @ 50 kg ha⁻¹ was applied equally in experimental field at the time of transplanting.

Five plants from each plot were selected and used for recording observations. The observations in respect of seed quality viz., weight of seeds flower⁻¹, test weight and germination per cent and seed yield parameters in terms of flowers plant⁻¹, seeds flower⁻¹, seed yield plant⁻¹, seed yield plot⁻¹ and seed yield ha⁻¹. Data were statistically analyzed in FRBD.

Results and Discussion

The data presented in table 1 revealed that, different levels of nitrogen and phosphorus had significant effect on seed quality and seed yield parameters of *Gaillardia*.

Seed quality parameters

Significantly maximum weight of seed flower⁻¹ (0.67 g), test weight (1.96 g) and germination per cent (70.52) were recorded with application of 150 kg N ha⁻¹ followed by 100 kg N ha⁻¹ (0.62 g, 1.85 g and 64.37 respectively). Whereas application of 0 kg N ha⁻¹ had produced minimum weight of seed flower⁻¹ (0.56 g), test weight (1.68 g) and germination per cent (56.69). This might be due to nitrogen which helped in improving the protein synthesis and resulted in production of bolder and healthy seeds. These results are in close conformity with the findings of Awchar *et al.*, (2010). They reported that an application of nitrogen 200 kg ha⁻¹ had recorded maximum test weight of seed in *gaillardia*. Similarly Saman and Kirad (2013) reported an application of nitrogen at 150 kg ha⁻¹ had recorded maximum test weight of seed in *calendula*. With respect to phosphorus, Significantly maximum weight of seed flower⁻¹ (0.64 g), test weight (1.88 g) and germination per cent (64.67) were recorded with application of 75 kg P ha⁻¹ found to be at par with 50 kg P ha⁻¹ (0.62 g, 1.85 g and 63.56 respectively). Whereas application of 0 kg P ha⁻¹ had produced minimum weight of seed flower⁻¹ (0.58 g), test weight (1.75 g) and germination per cent (60.76). This might be due to phosphorus which is an essential part of photosynthesis, it is required for the general health, vigour of plants and seed formation and seed development. These results are in close conformity with the findings of Natrajan and Vijayakumar (2002).

Table.1 Effect of nitrogen and phosphorus on seed quality and seed yield of gaillardia

Treatments	Weight of seeds flower ⁻¹	Test weight	Germination per cent	Flowers plant ⁻¹	Seeds flower ⁻¹	Seed yield plant ⁻¹ (g)	Seed yield plot ⁻¹ (kg)	Seed yield ha ⁻¹ (q)
Nitrogen								
N ₁ - 0 kg N ha ⁻¹	0.56	1.68	56.69	45.83	329.09	9.17	0.11	2.73
N ₂ - 50 kg N ha ⁻¹	0.59	1.76	59.98	53.36	352.95	11.07	0.13	3.28
N ₃ - 100 kg N ha ⁻¹	0.62	1.85	64.37	65.69	365.95	16.74	0.20	4.96
N ₄ - 150 kg N ha ⁻¹	0.67	1.96	70.52	78.46	390.64	20.50	0.25	6.07
SE (m) ±	0.01	0.03	0.91	2.03	5.44	0.40	0.005	0.14
CD at 5%	0.04	0.10	2.64	5.87	15.71	1.18	0.017	0.42
Phosphorus								
P ₁ - 0 kg P ha ⁻¹	0.58	1.75	60.76	55.35	348.75	13.05	0.16	3.87
P ₂ - 25 kg P ha ⁻¹	0.59	1.77	62.56	57.67	354.91	13.76	0.17	4.08
P ₃ - 50 kg P ha ⁻¹	0.62	1.85	63.56	63.30	362.95	14.92	0.18	4.42
P ₄ - 75 kg P ha ⁻¹	0.64	1.88	64.37	67.01	372.01	15.78	0.19	4.68
SE (m) ±	0.01	0.03	0.91	2.03	5.44	0.40	0.005	0.14
CD at 5%	0.04	0.10	2.64	5.87	15.71	1.18	0.017	0.42
Interaction effect								
N x P								
SE (m) ±	0.02	0.07	1.83	4.07	10.89	0.81	0.011	0.29
CD at 5%	-	-	-	-	-	-	-	-

They reported that an application of phosphorus at 125 kg ha⁻¹ had recorded maximum test weight of seed in marigold cv. African Gaint. Similarly Saman and Kirad (2013) reported that an application of phosphorus at 80 kg ha⁻¹ had recorded maximum seed yield in calendula.

The interaction effect due to nitrogen and phosphorus on seed quality parameters like weight of seeds flower⁻¹, test weight and germination per cent were found to be non-significant.

Seed yield parameters

The seed yield parameters in terms of flowers plant⁻¹ (78.46), seeds flower⁻¹ (390.64), seed yield plant⁻¹ (20.50 g), seed yield plot⁻¹ (0.25 kg) and seed yield ha⁻¹ (6.07 q) were found maximum with the individual application of 150 kg N ha⁻¹ and which was followed by 100 kg N ha⁻¹ (65.69, 365.95, 16.74 g, 0.20 kg and 4.96 q respectively). This might be due to nitrogen which increased photosynthetic activity and resulted into increased flower production and ultimately number of seeds flower⁻¹. Whereas application of 0 kg N ha⁻¹ had produced significantly minimum flowers plant⁻¹ (45.83), seeds flower⁻¹ (329.09), seed yield plant⁻¹ (9.17 g), seed yield plot⁻¹ (0.11 kg) and seed yield ha⁻¹ (2.73 q). These results are in conformity with the findings of Awchar *et al.*, (2010). They revealed that an application of 200 kg Nitrogen ha⁻¹ recorded maximum seed yield plant⁻¹ and seed yield ha⁻¹ in gaillardia. Similarly, Saman and Kirad (2013) reported an application of 100 kg Nitrogen ha⁻¹ had produce maximum number of seeds flower⁻¹, seed yield plant⁻¹ and seed yield ha⁻¹ in calendula.

Among the different levels of phosphorus applied, significantly maximum flowers plant⁻¹ (67.01), seeds flower⁻¹ (372.01), seed

yield plant⁻¹ (15.78 g), seed yield plot⁻¹ (0.19 kg) and seed yield ha⁻¹ (4.68 q) were found maximum with the individual application of 75 kg P ha⁻¹ and which was found to be at par with 50 kg P ha⁻¹ (63.30, 362.95, 14.92 g, 0.18 kg and 4.42 q respectively). This might due to phosphorus which is constituent of certain nucleic acid in the plant, it plays an important role in formation of seed. Whereas application of 0 kg P ha⁻¹ had produced significantly minimum flowers plant⁻¹ (55.35), seeds flower⁻¹ (348.75), seed yield plant⁻¹ (13.05 g), seed yield plot⁻¹ (0.16 kg) and seed yield ha⁻¹ (3.87 q). These results are in conformity with the findings of Swaroop *et al.*, (2007), recorded maximum number of seed flower⁻¹, seed yield plant⁻¹ and seed yield ha⁻¹ in *Tagetes erecta* L. cv. Pusa Basanti Gaiinda with an application of phosphorus 50 kg ha⁻¹. Also, Kumar and Moon (2014) recorded maximum seed yield in African marigold with an application of phosphorus 75 kg ha⁻¹.

The interaction effect due to nitrogen and phosphorus on seed quality parameters like weight of seeds flower⁻¹, test weight and germination per cent were found to be non-significant.

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