

Research Article



Evaluation of Bird of Paradise for Commercial Flower Production by using Organic Manures

Samia Ikram^{1*}, Riaz ur Rehman¹, Farwa Batool² and Atyab Amjad³

¹Horticultural Research Institute for Floriculture and Landscaping, Islamabad, Pakistan; ²Enhancing Productivity of Flowers at Peri-Urban Area of Lahore, Kala Shah Kaku, Punjab, Pakistan; ³Government Vegetable Seed Farm 83 and 85/10-R Khanewal, Pakistan.

Abstract | Crane flower commonly known as Bird of paradise (*Strelitzia reginae*) belongs to family Strelitziaceae. Bird of paradise is a beautiful multi color cut flower with a distinct flower shape of a bird and is an important commercial crop of tropical area. The present research work was designed to investigate the effect of different organic manures on the growth of Bird of paradise as commercial crop in agro metrological conditions of Islamabad during 2016-2018. Following four treatments were designed: T₁ (control), T₂ (Top dressing with FYM), T₃ (Top dressing with leaf manure), T₄ (Top dressing with sewage sludge). Maximum plant height (93.53 cm), Number of suckers (4.20), Number of leaves (8.00), Number of flowers (4.11), Stem diameter (5.025 cm) and Spike diameter (5.03 cm) were contributed by T₂ whereas maximum spike length (61.21 cm) was recorded in T₃ and maximum shelf life (14.81 days) was noted in T₄. The present research study revealed that T₂ significantly contributes to commercial cut flower production of Bird of paradise in agro metrological conditions of Islamabad.

Received | November 17, 2019; **Accepted** | September 18, 2020; **Published** | December 31, 2020

***Correspondence** | Samia Ikram, Horticultural Research Institute for Floriculture and Landscaping, Islamabad, Pakistan; **Email:** samiaikram@hotmail.com

Citation | Ikram, S., R. Rehman, F. Batool and A. Amjad. 2020. Evaluation of bird of paradise for commercial flower production by using organic manures. *Pakistan Journal of Agricultural Research*, 33(4): 940-944.

DOI | <http://dx.doi.org/10.17582/journal.pjar/2020/33.4.940.944>

Keywords | Bird of paradise, Commercial cut flower, Organic manures, Flower production

Introduction

Bird of paradise (*Strelitzia reginae*) also known as crane flower is a tropical plant that is popular in many countries as cut flower (USDA, 2003) but in Pakistan it still needs an introduction as a potential cut flower. Bird of paradise is a low-maintenance plant which is easy to grow and is suitable for landscaping (Gurung and Kumar, 2020) in recent years it is gaining popularity as cut flower because of its brilliant color, unusual appearance and long vase life. This plant has a close resemblance with banana plant. *Strelitzia* is evergreen and herbaceous plant with oblong leaf blades that can grow up to 1 meter in height. Its inflorescence produces four to six flowers with orange

color sepals and blue petals. The sepals and petals fuses into an arrow shaped structure that is surrounded by stamens and stigma, making it look like a bird (Huxley, 1992). Bird of paradise plants are frequently used in landscaping, but they are more attractive as cut flowers based on their exotic colors and shapes, as well as vase life (durability), length of stems, and plant resistance to pests and diseases it is also used in arrangements and for decoration (Macnish *et al.*, 2010; Terao *et al.*, 2005).

Bird of paradise requires a minimum temperature of 10°C to flourish in a well drained fertile soil rich in organic matter; the propagation via seed leads to hybridization of plant that is why it is mostly

multiplied by means of division (Elsa, 1998). Bird of paradise is a slow growing plant; it requires almost 4-6 months to establish itself in soil and starts producing flower in third year. The plant requires minimum of 6 feet spacing for good flowering (Hensley et al., 1998)

Good growth and better yield is achieved by fertilization; Organic mulches are rich in nutrients as they are made from manures (Anonymous, 1999). Top dressing is a fertilization technique in which fertilizer is applied to a crop during growing season to improve crop growth and yield. In this technique the nutrients are readily available to plant in its root zone. Plant growth, flowering and corm yield parameters were significantly affected by application of farmyard manure, which considered to best organic fertilizer for growing a successful crop (Gupta et al., 2008). Leaf compost is the best source of some vitamins, hormones and enzymes that a plant needs for optimum growth and development, that synthetic chemical fertilizers fails to supply. Rich resources of different nutrients are organic materials from residues from municipal and industrial waste, livestock farming, agriculture, green areas and forestry (Fitzpatrick, 1986). Benito (2005) reported that leaf manure with high nitrogen content are most suitable substrates with adequate supply of nutrients needed for healthy plant growth. Turhan (2007) found that rice husk mixed with Leaf Manure had significant effect on carnation growth and yield. Sewage sludge (biosolids), which is enriched in nitrogen, phosphorus, organic matter and other trace elements, represents a good source of nutrients for plant growth and a good soil conditioner to improve soil physical properties (Angin and Yağanoğlu, 2009). In urban areas sewage sludge is decomposed by its utilization in agriculture sector. High organic matter present in it improves the chemical, physical and biological properties of soil (Zhang et al., 2017).

The present research experiment will help out to evaluate the best suitable conditions for commercial production of this plant.

Materials and Methods

Growth conditions and Plant material; the plants of Bird of paradise were purchased from The Fateh Muhammad Nursery located in H-9 Islamabad. The plants were planted in August 2017 by keeping plant to plant and row to row distance of four feet under tunnel. Irrigation was done soon after plantation

and then as per plant requirement and climatic condition.

Treatments; Following organic fertilizers were applied as treatments

Treatment No	Treatment
T1	Control
T2	Top dressing with FYM
T3	Top dressing with Leaf Manure
T4	Top dressing with Sewage sludge

Treatment	Saturation %	Soil pH	EC.ds /m	Organic matter %	Available P mg/kg	Available K mg/kg
T1: Control	23	7.8	0.25	0.55	4.4	60
T2: Top dressing with FYM	24	8.2	0.26	0.75	6.6	120
T3: Top dressing with Leaf Manure	26	7.9	0.24	0.60	5.1	100
T4: Top dressing with Sewage sludge	24	8.0	0.23	0.65	4.7	80

Source: Soil and water testing laboratory data ghanj bakhsh road, Rawalpindi.

Parameters evaluated: Following parameters were studied during research period Plant Height (cm), Number of Suckers/Plant, Number of Leaves, Stem Diameter (cm), Number of Flowers/plant, Shelf life.

Statistical analysis

The experiment was laid down by using randomized complete block design (RCBD). The collected data will be analyzed by using statistic 8.1 and means were compared at probability level LSD 0.05 (Steel et al., 1997).

Results and Discussion

Plant height (cm)

The statistical data presented in Figure 1A reveals that mean maximum height for two years is contributed by T₂ 94.53 cm followed by T₁ that produced mean plant height of 77.49 cm, while the rest of the treatments T₄ and T₃ increased mean height as 75.28 cm and 68.53cm respectively. Our findings are in accordance with the work of Gupta et al., 2008 who stated that application of farmyard manure found beneficial for plant growth, flowering and corm yield parameters and considered to best for growing a successful crop.

Number of suckers

The mean statistical data of two years, present in Figure 1B reveals that maximum number of suckers 4.20 were counted for T₂ followed by T₄ with 2.89 numbers of suckers. The rest of the treatments T₃ and T₁ contributed to 2.73 and 1.88 number of suckers, respectively. Our findings are in accordance with the work of Ngetich *et al.*, 2012 who reported the beneficial effect of farm yard manure on various growths attributes like plant height, number of leaves, number of branches, internodes length and leaf area index.

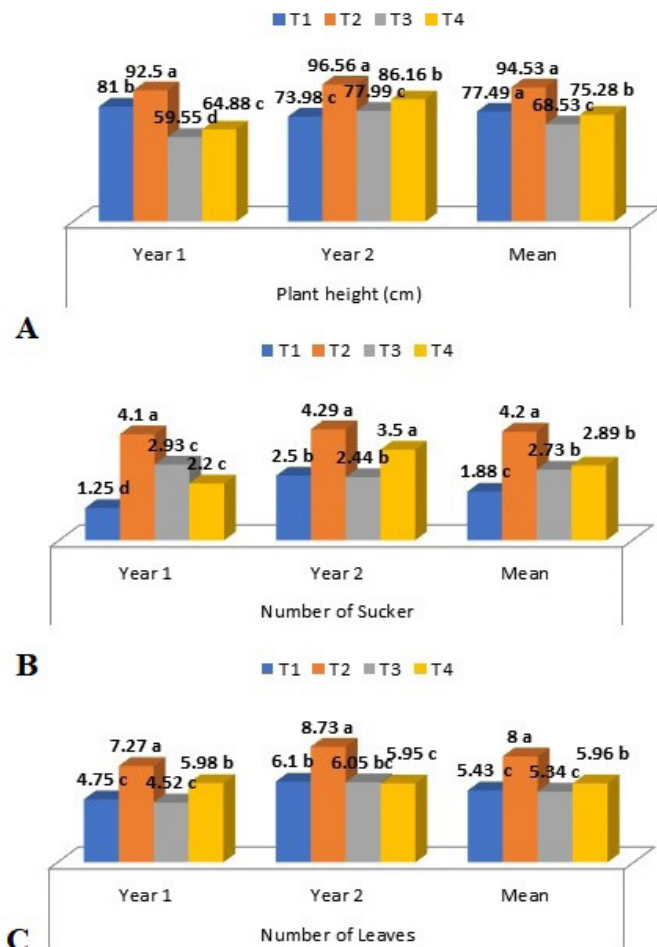


Figure 1: Showing effect of different organic fertilizers on vegetative parameters of Bird of paradise.

Number of leaves

According to mean statistical data presented in Figure 1C, it is observed that maximum numbers of 8 leaves were produced by T₂ followed by T₄ with 5.96 numbers of leaves. The other two treatments T₁ and T₃ produced 5.43 and 5.34 number of leaves. Similar trends were reported by Alemu and Kapoor, 2007 and Atta-Alla *et al.*, 2003 who observed that farm yard manure helps in increasing plant growth which ultimately improved flowering and yield.

Number of flowers

As per mean data presented in Figure 2A, it can be seen that maximum number of flowers 4.11 are contributed by T₂ and the minimum of 1.09 flowers were recorded for T₁ while the rest of the treatments T₄ and T₃ contributed to 2.84 and 1.79 number of flowers respectively. Similar results were reported by Patel *et al.*, 2017 who stated that all flowering and yield attributes were positively affected by organic manure as they add organic compounds to the soil after decomposition they nourish beneficial soil micro-organisms which improve availability of nutrients.

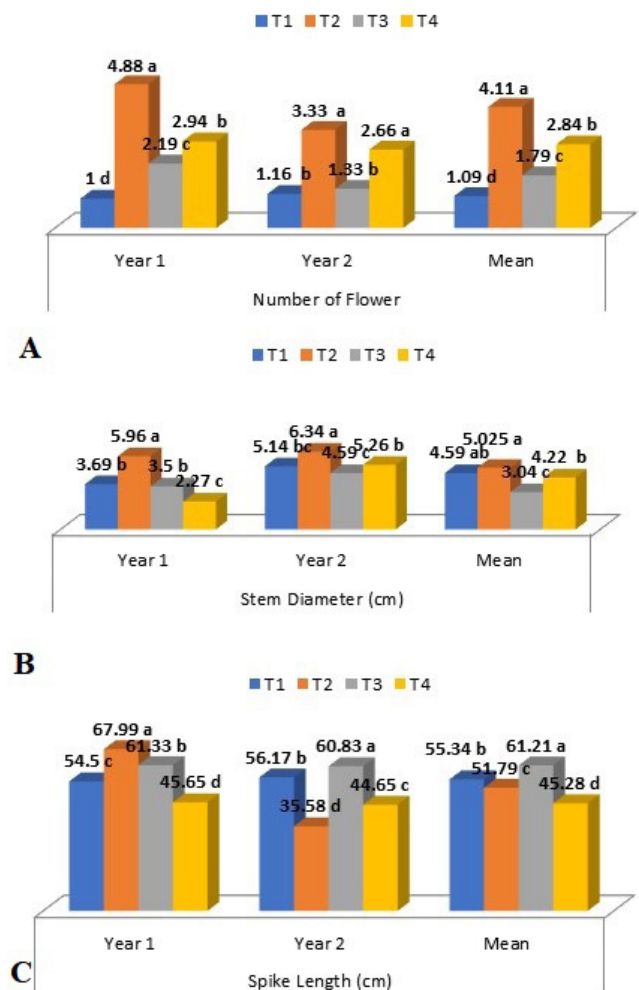


Figure 2: Showing effect of different organic fertilizers on Reproductive and quality parameters of Bird of paradise.

Stem diameter (cm)

The mean statistical data regarding stem diameter present in Figure 2B reveals that the thickest stem 5.025 cm in bird of paradise is observed in T₂ followed by T₄ with stem diameter of 4.22 cm. The other treatments T₁ and T₃ contributed to stem diameter of 4.59 and 3.04cm. Our findings are in accordance with the previous findings of Gupta *et al.*, 2008 and

Ngetich *et al.*, 2012 who reported the significant effect of FYM on plant growth.

Spike length (cm)

It can be observed from the mean data presented in Figure 2C that maximum 61.21 cm length of spike is recorded in T_3 and the minimum flower spike of 45.28 cm is recorded for T_4 while spike length of 55.34 cm and 51.79 cm were contributed by T_1 and T_2 respectively. Our results are in line with the findings of Perin *et al.*, 2004 and Oliveira *et al.*, 2010 who reported that application of organic manures of plant origin like leaf manure contain rhizobium bacteria that promotes nitrogen fixation and aids to improve growth parameters in plants.

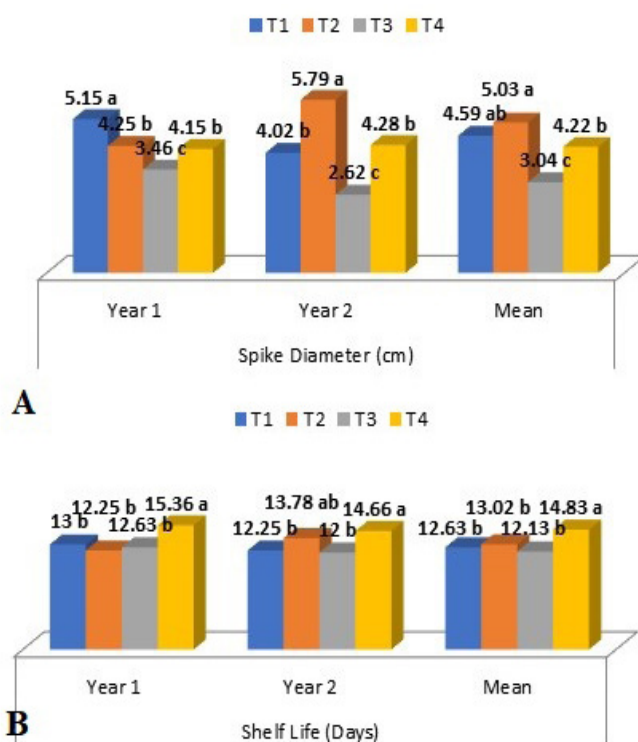


Figure 3: Showing effect of different organic fertilizers on quality parameters of bird of paradise.

Spike diameter (cm)

The mean data presented in Figure 3A shows that maximum spike length 5.79 cm is observed in T_2 followed by T_1 by producing spike diameter of 4.59 cm while the other two treatments T_4 and T_3 contributed to produce spike length of 4.22 cm and 3.04 cm in bird of paradise. Our findings are in line with the research findings of Waheeduzzama *et al.* 2006 (Anthurium cv. Meringue) and Nagalakshmi *et al.*, 2010 (Anthurium cv. Verdun Red) who reported that application of FYM has some improvement role in flower parameters such as spike length.

Shelf life (Days)

It can be observed from the Figure 3B that maximum vase life of 14.83 days in bird of paradise cut flower is contributed by T_4 while the rest of the treatments T_2 , T_1 and T_3 are statistically at par by contributing to shelf life of 13.02, 12.63 and 12.13 days respectively. Similar findings were observed in the work of Solanki *et al.*, 2017 who stated that Organic waste application to soil can help to improve agricultural productivity.

Conclusions and Recommendations

On the basis of above study it is concluded that top dressing of Farm yard manure is beneficial for better growth of bird of paradise in agro metrological conditions of Islamabad. In the present study top dressing of Farm yard manure contributed significantly in production of maximum growth parameters. Bird of paradise though beautiful and attractive but has a slow growth, the plant usually takes one to two years to establish itself for flowering which limits its production as a commercial cut flower and makes it infeasible as a main cash crop; however, it can be grown as a perfect side crop that can fetch good capital.

Novelty Statement

Bird of paradise is a beautiful bird like flower with known aesthetic value, the commercial scale potential of which is yet to be exploited in developing country like Pakistan, to which the present study is a minor addition

Author's Contribution

Samia Ikram compiled data and wrote menu-script, Dr. Riaz ur Rehman wetted the research paper and suggested improvent. Farwa Batool helped in data analysis and Atyab Amjad helped in data collection.

Conflict of interest

The authors have declared no conflict of interest.

References

- Alemu, T. and I.J. Kapoor. 2007. In vivo evaluation of Trichoderma species against Botrytis corm rot/blight of gladiolus. Ethiop. J. Biol. Sci., 6(2): 165-171. <https://doi.org/10.4314/ejbs.v6i2.45461>

- Angin, I. and A.V. Yağanoğlu. 2009. Application of sewage sludge as a soil physical and chemical amendment. *Ekoloji*, 19(73): 39-47. <https://doi.org/10.5053/ekoloji.2009.735>
- Anonymous, 1999. Compost utilization on the farm. In: Field guide to on-farm composting (Mark D., ed). Natural Resource, Agriculture and Engineering Service Publication No.114, Ithaca, NY, USA. pp. 85-97.
- Atta-Alla, H.K., M.A. Zaghoul, M. Barka and K.H. Hashish. 2003. Effect of organic manure and NPK fertilizers on the vegetative growth, flowering and chemical composition of some gladiolus cultivars. *Ann. Agric. Sci. Moshtohor.*, 41(2): 889-912.
- Benito, M., A. Masaguer, R.D. Antonio and A. Moliner. 2005. Use of pruning waste compost as a component in soil less growing media, *Bioresour. Technol.*, 96: 597-603. <https://doi.org/10.1016/j.biortech.2004.06.006>
- Fitzpatrick, G.E., 1986. Sludge processing effects on compost quality. *Biol. Cycle*, 27: 32-35.
- Gupta, P., N. Rajwal, V.K. Dhaka and D. Rajwal. 2008. Effect of different levels of vermicompost, NPK and FYM on performance of gladiolus (*Gladiolus grandiflorus* L.) cv. Happy End. *Asian J. Hortic.*, 3(1): 142-143.
- Elsa, 1998. <https://www.rhs.org.uk/advice/profile?pid=847>
- Gurung, A. and R. Kumar. 2020. Bird of Paradise (*Strelitzia reginae*): A Low Maintenance, High Potential Ornamental Plant. *Indian Farmer*, 7(01): 37-43.
- Turhan, F.H., Kahriman, C.O. Egesel and M.K. Gul. 2007. The effects of different growing media on flowering and corm formation of saffron (*Crocus sativus* L.). *Afr. J. Biotech.*, 6: 2328-2332. <https://doi.org/10.5897/AJB2007.000-2365>
- Hensley, D., J. Deputy, J. Yogi and K. Leonhardt. 1998. Bird-of-Paradise. *CTAHR Univ. Hawaii Ornamentals Flowers*, 27: 1-2.
- Huxley, A., 1992. *RHS dictionary of gardening* Macmillan, 4: 386.
- Macnish, A.J., M.S. Reid, A. Marrero, C.Z. Jiang. 2010. Improving the postharvest performance of bird-of-paradise flowers. *Acta. Hortic.*, 877: 1763-1770. <https://doi.org/10.17660/ActaHortic.2010.877.242>
- Nagalakshmi, S., A. Sankari, M. Anand and R. Arulmozhiyan. 2010. Organic stimulants on the growth and yield of anthurium (*Anthurium andreanum*) cv. Verdun Red. *Asian J. Hortic.*, 5(2): 450-452.
- Ng'etich., O.K., J.N. Aguyohand and J.O. Ogwen. 2012. Effects of composted farmyard manure on growth and yield of spider plant (*Cleome gynandra*). *Int. J. Sci. Nat.*, 3(3): 514-520.
- Oliveira, F.L., C.I.L. Gosch, M.S. Gosch and M.D. Massad. 2010. Produção de fitomassa, acúmulo de nutrientes e decomposição de leguminosas utilizadas para adubação verde. *Revista Brasileira de Ciências Agrárias (Agrária)*. 5(4): 503-508. <https://doi.org/10.5039/agraria.v5i4a889>
- Patel, V.S., V.R. Malam, K.H. Nurbhanej, A.N. Vihol and J.R. Chavada. 2017. Effect of organic manures and biofertilizers on growth, flowering and flower yield of rose (*Rosa hybrida* L.) cv. Gladiator. *Int. J. Chem. Stud.*, 5(5): 1924-1927.
- Perin, A., R.H.S. Santos, S. Urquiaga, J.G.M. Guerra and P.R. Cecon. 2004. Produção de fitomassa, acúmulo de nutrientes e fixação biológica de nitrogênio por adubos verdes em cultivo isolado e consorciado. *Pesqui. Agropecuária Bras.*, 39(1): 35-40. <https://doi.org/10.1590/S0100-204X2004000100005>
- Pooley, E., 1998. Wild Flowers KwaZulu-Natal and the East Region. Natal Flora Trust.
- Solanki, P., B. Kalavagadda, B. Akula, S.H.K. Sharma and D.J. Reddy. 2017. Effect of sewage sludge on marigold (*Tagetes erecta*). *Int. J. Curr. Microbiol. App. Sci.*, 6(6): 825-831. <https://doi.org/10.20546/ijcmas.2017.606.097>
- Terao, D., T.T. Graziano and Strelitziaceae. 2005. In: *Flores tropicais: Tropical flowers*. Editora EMBRAPA, Brasília. pp. 129- 139.
- Steel, R.G.D., J.H. Torrie and M.A. Boston. 1997. Principles and procedures of statistics: A biometrical approach. 3rd edition, McGraw Hill Book Company Inc. New York. pp. 633.
- USDA/ Floriculture Crops, 2003. <http://www.usda.mannlib.cornell.edu/reports/nassr/other/zfc-bb>.
- Waheeduzzama, M., M. Jawaharlal, R. Arulmozhiyan and K. Indhumathi. 2006. Effect of integrated management practices on flower quality and vase life of *Anthurium andreanum* cv. Meringue. *J. Orn. Hortic.*, 9(2): 142-144.
- Zhang, X., X.Q. Wang and D.F. Wang. 2017. Immobilization of heavy metals in sewage sludge during land application process in China: A Review. *Sustainability*, 9: 1-19. <https://doi.org/10.3390/su9112020>