Original Research Article

Effect of organic fertilizers, inorganic fertilizers and biofertilizers on ~~growth ,~~growth, yield and quality of Sponge gourd (*Luffaaegyptica*)

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ABSTRACT

The present investigation entitled "Effect of organic fertilizers, inorganic fertilizers and biofertilizers on growth, yield and quality of Sponge gourd (Luffaaegyptica)" was carried out at Department of Horticulture, SHUATS, Prayagraj (U.P) during rabi season of 2022 for evaluation of different treatment of Sponge gourd and its component traits of 9 treatment, with three replication in Randomized Block Design (RBD). Studies shows that, among all the treatments T7 was found to be the best out of the 9 treatments in terms of growth, yield and quality with days to germination (11.5 DAS), days to emergence (25.08 DAS), survival percentage (79.67%),Vine length (20,40,60 DAS) (115.60 cm,271.10 cm, 453.70 cm), appearance of first male (47.75 DAS) and female flower (54.64%) in 50% flowering, days to first harvest (64.80 DAS), No. of fruits per plant (24.81), fruit length (24.81 cm), fruit diameter (6.13), fruit weight (181.71 g), Yield per hectare(t) (16.20 t/ha), TSS (Total soluble solids) (4.72^{0}Brix), Ascorbic acid content (10.01 mg), Fruit colour (138.6). In terms of Economics, gross return, net return and benefit cost ratio was also recorded in T7 (80% RDF through CF+ 20% through Vermicompost + PSB + Azotobacter) with gross return (Rs, 3,20,400) , net return (Rs 2,35,750) along with benefit cost ratio (3.7) .

Keywords: growth, yield, quality, FYM, Vermicomost, PSB, Azotobacter

Introduction:

Sponge gourd (Luffaaegyptica) is an important vegetable crop having chromosome no. (2n=26). It is a summer season vegetable. Sponge gourd grows well in soils having a Ph value around 6 to 6.8. It is an annual climbing plantwhich produces fruit containing fibrous vascular system and cross pollinated in nature. It is difficult to assign withaccuracy the indigenous area

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of *Luffa*species. They have a long history of cultivation in tropicalcountries of Asia and Africa. Indo-Burma is reported to be the center of diversity for sponge gourd andis originated in subtropical Asian region particularly India. Luffaaegyptica, commonly known assponge gourd is a member of Cucurbitaceous family. They have a long history of cultivation in thetropical countries of Asia and Africa. The vernacular names of sponge gourd are kali tori, ghia tori,torianemia, nenuwa, chiori, dundul, thuppaheerakayi, ghosaligilka, bhol or taradaand ghiraula indifferent parts of the world. The main commercial production countries are China, Korea, India, Japanand CentralAmerica.ManydiversityofspongegourdalsoexitsinNepal.Luffarequiresalongwarmseason forbestproduction.Italsogrowsbestduringthe rainy season. Due to its hard seed coat, there is a problem with seedgermination when thetemperatureislow.

Nitrogen, Phosphorus and Potassium play a significant role in the plant growth and development such as nitrogen support the vegetative part of the plant and phosphorus have a significant role in the development of the root and also producing the energy by forming ATP and potassium encourage carbohydrates metabolism, enzymes establishment and osmotic regulation. Organic fertilizer application improve the growth of sponge gourd by supplying plant nutrients including micro nutrients as well as improving chemical, physical and biological properties of the soil, thereby providing a better environment for root development by improving the soil structure. To achieve higher production of sponge gourd the expensive commercial fertilizers are recommended but use of excess inorganic fertilizers as per the recommendations soil health and environment sustainability is on sake. So to achieve higher productivity and to maintain the environment balance use of chemical fertilizers is needed. Application of organic fertilizer, bio fertilizers which is environment friendly and low cost input with inorganic fertilizers play an important role in plant nutrition. The application of biofertilizer is very good for sustainable agriculture.

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Materials and methods:

The experiment was conducted in Horticultural Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (UP) during 2022. All the facilities necessary for cultivation, including labour were made available by the department. It is situated at an elevation of 98 meters above

sea level at $25^0$87 North latitude and 81.15^0Eastlongitude.Thisregionhasasub-tropicalclimateprevailingintheSouth-EastpartofUttarPradeshwiththboththe extremesintemperature, i.e.thewinterandthesummer.The sowing of seed of Sponge gourd was done in February 9, 2022 .The experiment was laid out in Randomized Block Design (RBD) with 9 treatments and 3 replications at a spacing of 60 cm x 120 cm. Normal cultural practices and plant protection measures was followed during the cultivation process. Treatments involved were T_0- (90% NPK + FYM 20t/ha), T_1- (80% CF + 20% through FYM), T_2- (80% CF + 20% through vermicompost), T_3 (80% CF + 20% through FYM + PSB), T_4- (80% CF + 20% through vermicompost + PSB), T_5 (80% CF + 20% through FYM + Azotobacter), T_6 (80% CF + 20% through FYM + Azotobacter, T_7- (80% CF + 20% through FYM + PSB + Azotobacter), T_8- (80% CF + 20% through FYM + PSB + Azotobacter). The field was prepared well by proper ploughing and tillage. The seeds were soak overnight treated with the treatments and sown the next day in February 9, 2022 with respective spacing. The observation regarding growth, yield and quality were recorded. The sources of organic and inorganic fertilizers applied in this treatments are FYM and Vermicompost, Urea, DAP (Di- Ammonium Phosphate) and MOP (Muriate of Potash) and as for biofertilizer PSB and Azotobacter. The significance and non significance of the treatment effect were judged with the help of 'f' value (variance ratio) was compared with the table value at 5% level of significance.The significant difference between the means was tested against critical difference at 5% level of significance.

Result and Discussion

3.1 Growth Parameters

Days to germination (cotyledons): The minimum days to germination was recorded in T7 (80% RDF through CF + 20% through FYM + PSB + Azotobacter) at (10.1 DAS) followed by T6 (80% RDF through CF + 20% through FYM + Azotobacter) at (10.3 DAS) and the maximum days to germination was recorded in T0 (RDF(Control 25:35:30 NPK +FYM 20 t/ha) at (11.5 DAS). The present findings corroborate with the findings of Fenner and Thomson (2005).

Days to emergence (true leaf): The minimum days to emergence of true leaf was observed in T7 (80% RDF through CF + 20% through FYM + PSB + Azotobacter) at (22.06 DAS) followed by

T6 (80% RDF through CF + 20% through FYM + Azotobacter) at (23.02 DAS) and the maximum days to emergence of true leaf was observed in T0 (RDF (Control 25:35:30 NPK +FYM 20 t/ha) at (25.08 DAS) Similar findings were obtained by Lingaiah, H.B.,B.C.Uthaih and P.S. Herle. (1993)

Survival percentage: The highest survival percentage was observed in T7 (80% RDF through CF + 20% through FYM + PSB + Azotobacter) at (79.67%) followed by T6 (80% RDF through CF + 20% through FYM + Azotobacter) at (78.82%) and the minimum survival percentage was observed in T0 (RDF (Control 25:35:30 NPK +FYM 20 t/ha) at (71.23%).

Days to 50% flowering: The minimum days to 50% flowering was observed in T7 (80% RDF through CF + 20% through FYM + PSB + Azotobacter) at (38.37 DAS) followed by T6 (80% RDF through CF + 20% through FYM + Azotobacter) at (40.61 DAS) and the maximum days to 50% flowering was recorded in T0 (RDF (Control 25:35:30 NPK +FYM 20 t/ha) at (54.64 DAS). The present findings corroborate with the findings of Ehigiator (1988).

Vine length (40 days): The maximum vine length in 40 days was seen in T7 (80% RDF through CF + 20% through FYM + PSB + Azotobacter) with (271.10 cm) followed by T6 (80% RDF through CF + 20% through FYM + Azotobacter) with 242.00 cm) and the minimum vine length in 40 days was seen in T0 (RDF (Control 25:35:30 NPK +FYM 20 t/ha) with (203.10 cm).Similar findings were also obtained Sareedhar*et al.,* (2006)

Days to first harvest: The minimum days to first harvest was recorded in T7 (80% RDF through CF + 20% through FYM + PSB + Azotobacter) with (64.80 DAS) followed by T6 (80% RDF through CF + 20% through FYM + Azotobacter) with (65.40 DAS) and the maximum days to harvest was recorded in T0 (RDF (Control 25:35:30 NPK +FYM 20 t/ha) with (68.20 DAS).

Table no.1 Effect of organic fertilizers, inorganic fertilizers and biofertilizers on growth of Sponge gourd

Treatment	Days to germination	Days to emergence	Survival percentage	Days to 50%	Vine length (40	Days to first

				flowering	days)	harvest
T_0	11.5	25.08	71.23	54.64	203.10	68.20
T_1	11.1	24.09	71.66	51.12	215.70	66.60
T_2	11.2	25.06	73.38	50.86	216.30	67.50
T_3	11	25.07	74.89	46.38	218.10	66.60
T_4	10.8	25.06	75.81	45.19	231.00	66.40
T_5	10.6	25	76.94	41.37	234.60	66.10
T_6	10.3	23.02	78.82	40.61	242.00	65.40
T_7	10.1	22.06	79.67	38.37	271.10	64.80
T_8	10.5	23.06	78.39	41.31	238.04	66
S.Ed(±)	0.45	0.73	3.29	1.58	12.61	3.06
CD at 5%	1.83	2.94	9.10	3.36	26.73	6.04

Yield Parameters

Fruit length (cm): The maximum fruit length was seen in T7 (80% RDF through CF + 20% through FYM + PSB + Azotobacter) with (24.81 cm) followed by T6 (80% RDF through CF + 20% through FYM + Azotobacter) with (23.92 cm) and the minimum fruit length was seen in T0 (RDF (Control 25:35:30 NPK +FYM 20 t/ha) with (10.17 cm). More or less the above findings are close agreement with the results of Mohammed *et al.*, (2000), Jan *et al.*, (2000), Patil (1998) and Umamaheswarappa*et al.*, (2000) in ridge gourd whereas, Siyag and Arora (1988) in Sponge gourd.

Fruit diameter (cm): The maximum fruit diameter was seen in T7 (80% RDF through CF + 20% through FYM + PSB + Azotobacter) with (6.13) followed by T6 (80% RDF through CF + 20% through FYM + Azotobacter) with (6.07) and the minimum fruit diameter was seen in T0 (RDF (Control 25:35:30 NPK +FYM 20 t/ha) with (4.08). These findings are in conformity with finding of Mausi (1960) also reported that application of muskmelon resulted in bigger fruit.

Fruit weight (g): The maximum fruit weight was seen in T7 (80% RDF through CF + 20% through FYM + PSB + Azotobacter) with (181.71 g) followed by T6 (80% RDF through CF + 20% through FYM + Azotobacter) with (174.34g) and the minimum fruit weight was seen in T0 (RDF (Control 25:35:30 NPK +FYM 20 t/ha) with (76.08 g). In addition, fruit length and fruit diameter exercised positively on fruit weight under T_{12}Bahadur A., Singh J., Singh K.P., Upadhyay A.K., and Rai., (2006)

No. of fruits per plants: The maximum no. of fruits was recorded inT7 (80% RDF through CF + 20% through FYM + PSB + Azotobacter) with (24.81) followed by T6 (80% RDF through CF + 20% through FYM + Azotobacter) with (23.92) and the minimum no. of fruits was recorded in T0 (RDF (Control 25:35:30 NPK +FYM 20 t/ha) with (10.17).

Yield per hectare (t/ha): The maximum Yield per hectare was observed inT7 (80% RDF through CF + 20% through FYM + PSB + Azotobacter) with (16.20 t/ha) followed by T6 (80% RDF through CF + 20% through FYM + Azotobacter) with (15.75 t/ha) and the minimum yield per hectare was recorded in T0 (RDF (Control 25:35:30 NPK +FYM 20 t/ha) with (8.34 t/ha).These results are in support with findings of Raja, S., B.G. Bagle and D.G. Dhandar(2007).

Table 2 :List of treatments and quality parameters

Treatments	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	No. of fruits per plant	Yield per hectare (t/ha)
T0	10.17	4.08	76.08	10.17	8.34
T1	11.50	4.29	86.74	11.50	8.62
T2	13.04	4.36	97.21	13.04	11.53
T3	13.37	5.07	102.62	13.27	14.08
T4	16.95	5.16	138.56	16.95	14.48
T5	17.62	5.21	161.39	17.62	15.57
T6	23.92	6.07	174.34	23.92	15.75
T7	24.81	6.13	181.71	24.81	16.20

T8	18.31	5.62	164.31	18.31	15.69
SEd(±)	0.81	0.2	8.26	0.67	0.23
CD at 5%	1.72	0.42	17.51	1.72	1.56

Quality Parameters

TSS (Total Soluble Solids): Themaximum total soluble solids was recorded in T7 (80% RDF through CF + 20% through FYM + PSB + Azotobacter) with (4.72^0Brix) followed by T6 (80% RDF through CF + 20% through FYM + Azotobacter) with (4.7^0Brix) and the minimum total soluble solids was recorded in T0 (RDF (Control 25:35:30 NPK +FYM 20 t/ha) with (4.26^0Brix).

Ascorbic acid (mg): The maximum ascorbic acid content was observed inT7 (80% RDF through CF + 20% through FYM + PSB + Azotobacter) with (10.01 mg) followed by T6 (80% RDF through CF + 20% through FYM + Azotobacter) with (9.54 mg) and the minimum ascorbic acid content was observed in T0 (RDF (Control 25:35:30 NPK +FYM 20 t/ha) with (8.34 mg). These findings are in accord with Chaudhary *et al.*, (2019) and Imnatemsueet*et al.*, (2020)

Fruit colour: The maximum fruit colour was observed in T7 (80% RDF through CF + 20% through FYM + PSB + Azotobacter) with (138.6) followed by T6 (80% RDF through CF + 20% through FYM + Azotobacter) with (136.5) and the minimum fruit colour was observed in T0 (RDF (Control 25:35:30 NPK +FYM 20 t/ha) with (132.06).

Table 3 :Different Treatments showing quality matrices

Treatments	**TSS**	**Ascorbic acid**	**Fruit colour**
T0	4.26	7.75	132.06
T1	4.36	7.90	132.6
T2	4.4	8.12	133.7
T3	4.53	8.20	133.8
T4	4.59	8.34	134

T5	4.63	8.56	134.4
T6	4.7	9.54	136.5
T7	4.72	10.01	138.6
T8	4.65	8.75	135.3
SEd(±)	1.22	0.01	0.34
CD at 5%	0.17	0.88	0.23

Conclusion

The results from the present investigation concluded Sponge gourd (Luffaaegyptica) T_7 (80% through CF + 20% through vermicompost + Azotobacter) was identified as the superior treatment in terms of growth, yield and quality of Sponge gourd (Luffaaegyptica) cv (TMSG 1609). Regarding economics of various treatments maximum gross return (Rs 3,20,400) and net return (Rs.2,35,750) along the benefit cost ratio (3.7) was also obtained maximum in T_7 (80% through CF + 20% through vermicompost + Azotobacter).

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