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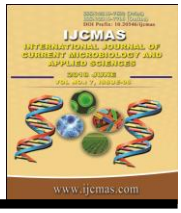

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Effect of Different Fertilizers on Growth Parameters of Sorghum (*Sorghum bicolor*)

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A B S T R A C T

Sorghum (*Sorghum bicolor*) is the best fodder crop in many countries for fulfilling the need of daily food of the cattle. The area under cultivation is decreasing day by day and pressure for fodder production is increasing. Sorghum is best known for its palatability and digestibility character which make it superior than other kharif season fodder crops. Study was carried out in Lovely Professional University, Phagwara experimental field to check out the effect of different organic and inorganic combination on the growth parameter of fodder crops. Inorganic fertilizer NPK and organic fertilizers FYM, flyash and vermicompost were used. Data was recorded at 60 and 120 days after sowing. SPSS software was used to analyse the data statistically. The experiment was carried out in year 2017 in kharif season. Eight treatments with combination of different organic and inorganic were used along with three replication. Crop growth parameters (Plant height, Stem girth, Number of leaves, Leave length and Plant population per plot) were observed. Crop growth parameters (Plant height, leaves length and number of leaves, stem girth and plant population) were measured at 60 DAS and 120 DAS.T8 (25%RDF + 25%FYM + 25%Flyash + 25%Vermicompost) gave significant result in term of growth characters with respect to control treatment (no application of organic and inorganic fertilizers).

Introduction

Sorghum [*Sorghum bicolor* (*L.*) Moench] is also known as "Jowar" belongs to grass poaceae family (Sharnkumar *et al.*, 2012). Sorghum is essential seasonal crop as well as stand fifth number all over the world out of major resources of foods like wheat and maize. (Sharnkumar *et al.*, 2012). *Sorghum bicolor* and sorghum vulgare are two famous varieties of sorghum. In terms of sorghum production India ranks second just after USA. Karnataka, Andhra Pradesh, Rajasthan, Maharashtra, Madhya Pradesh are the major sorghum growing states, however Karnataka contributes the maximum share in sorghum production (Sharnkumar *et al.*, 2012). The livestock animals achievements depends upon adequate amount of beneficial fodder and their supplies for maintenance, growth and production. Since, the green fodder is cheapest source of animal food. India has almost 40% supply of green forage production at present (Joshi *et al.*, 2007).

All the crops require supplements such as synthetic fertilizers in combination with organic fertilizers to improve the agricultural productivity (Patel *et al.,* 1994). Application of organic manures for sorghum is important to increase its yield so that it can meet the minimum requirement for animals. If we discuss about organic manures, they are basically composed of waste and residues parts from plants and animals (Elawad, 2004). Nitrogen is most important nutrient for increasing productivity and quality of forage crops. Acceleration of meristematic activity and encouragement of vegetative growth are some of the known effects of nitrogen on fodder sorghum (Siddque, 1989). Application of nitrogenous fertilizers to sorghum is essential because of the wide spread deficiency of nitrogen in most of the Indian soils (Raheja, 1966).

Materials and Methods

Experimental detail

The experiment was conducted at the farm of Lovely Professional University, Phagwara entitled with "Effect of different fertilizers on growth parameters of sorghum (*Sorghum bicolor*)" during Kharif season in year 2017-2018. In experiment 8 treatments and three replications were used by Randomized complete block design. Three organic (FYM, Flyash and Vermicompost) and inorganic source (urea) were used in different combinations.

Table 1 show the detail number of treatments. Variety SX-17 sorghum of sygenta company was used for this experiment and it was multicut variety. The characters of variety are best in term of height, stem girth, number of leaves and yield. Seed was sown on 14 June in kharif season. 5-6 kg seed rate per acre was used and sowing was done by line method with row to row spacing 30cm. the seed was sown about approximately depth of 4-6cm. Nitrogen was applied as basal dose as per treatment and remaining nitrogen in split doses at different critical stages of growth. Organic fertilizers were applied in soil 15 days before sowing of crop as per treatments.

Data were analyzed by Duncan's Multiple Range Tests (DMRT) for separation of means with a probability $p<0.05$. Differences between mean values were evaluated by Analysis of Variance (ANOVA) using the software SPSS 16.

Results and Discussion

Stem Girth (mm)

The data collected at 60 and 120 DAS showed that the stem girth significantly increased in both readings in treatment T8 (25%RDF + 25%FYM + 25%Flyash + 25%Vermicompost) as compared to control treatment. Meena *et al.,* (2013) found similar results when organic fertilizers were used in combination of inorganic fertilizers. The integrated uses of nutrient helped in providing the nutrients in adequate amount and hence help in increasing the stem girth.

Plant height (cm)

The plant height at 60 and 120 DAS significantly increased in treatment T8 (25% RDF + 25% FYM + 25% Flyash + 25% Vermicompost) as compared to control treatment. Plant height, panicle diameter, panicle length and Stover yield was increased significantly due to the combined use of 100% RDF + FYM 2.5 t per ha. This same result was recorded when RDF + FYM + PSB was used (Mudalagiriyappa *et al.,* 2012). Plant height and photosynthates accumulation significantly improved due to application of 75% RDN + 25% vermicompost + seed treatment with PSB (Bhalerao *et al.,* 2001).

Table.1 Treatment Details

T1		Control
T2		100%RDF
T3		50%RDF + 50%FYM
T4		50%RDF + 50%Fly ash
T5		50%RDF + 50%Vermicompost
T6		25%RDF + 25%Fly ash + 50%FYM
T7		25%RDF + 50%Fly ash + 25%Vermicompost
T8		25%RDF + 25%FYM + 25%Fly ash + 25%Vermicompost

Table.2 Effect of different organic and inorganic application on stem girth of sorghum

	1st cutting	2nd cutting
Treatment	**Stem girth**	**Stem girth**
T1= Control	14.16^{d}±0.16	16.5^{d}±0.28
T2= 100%RDF	19.80^{bc}±0.35	22.11^{bc}±0.97
T3= 50%RDF + 50%FYM	19.60^{c}±0.44	21.67^{bc}±1.35
T4= 50%RDF + 50%Fly Ash	20.26^{bc}±0.44	21.34^{bc}±1.27
T5= 50%RDF + 50% Vermicompost	20.30^{bc}±0.4	21.23^{c}±0.39
T6=25%RDF + 25%FA + 50%FYM	24.11^{a}±0.47	24.60^{ab}±0.69
T7=25%RDF + 50%FA + 25%VC	21.01^{b}±0.58	20.64^{c}±1.28
T8=25%RDF + 25%FYM + 25%FA + 25%VC	24.67^{a}±0.33	25.28^{a}±0.65

The mean followed by different letters are significantly at p<0.05, according to DMRT (Duncan's Multiple Range Test) for separation of means. Note – T1 (Control), T2 (100%RDF), T3 (50%RDF + 50%FYM), T4 (50%RDF + 50%flyash), T5 (50%RDF + 50%Vermicompost), T6 (25%RDF + 25%FA + 50%FYM), T7 (25%RDF + 50%FA + 25%VC), T8 (25%RDF + 25%FYM + 25%FA + 25%VC).

Table.3 Effect of different organic and inorganic application on plant height

	1st cutting	2nd cutting
Treatment	**Plant height**	**Plant height**
T1= Control	147^{e}±1.45	155^{d}±2.02
T2= 100%RDF	215^{c}±5.13	229^{b}±6.96
T3= 50%RDF + 50%FYM	206^{c}±2.96	215^{bc}±6.53
T4= 50%RDF + 50%Fly Ash	213^{c}±6.32	214^{bc}±3.75
T5= 50%RDF + 50% Vermicompost	187^{d}±5.31	208^{c}±4.42
T6=25%RDF + 25%FA + 50%FYM	238^{b}±3.4	261^{a}±2.4
T7=25%RDF + 50%FA + 25%VC	204^{c}±4.07	207^{c}±4.27
T8=25%RDF + 25%FYM + 25%FA + 25%VC	255^{a}±2.88	266^{a}±7.31

The mean followed by different letters are significantly at p<0.05, according to DMRT (Duncan's Multiple Range Test) for separation of means. Note – T1 (Control), T2 (100%RDF), T3 (50%RDF + 50%FYM), T4 (50%RDF + 50%flyash), T5 (50%RDF + 50%Vermicompost), T6 (25%RDF + 25%FA + 50%FYM), T7 (25%RDF + 50%FA + 25%VC), T8 (25%RDF + 25%FYM + 25%FA + 25%VC).

Table.4 Effect of different organic and inorganic application on number of leaves of sorghum

	1st cutting	2nd cutting
Treatment	**No. of leaves**	**No. of leaves**
T1= Control	7.2^{d}±0.15	7.8^{d}±0.15
T2= 100%RDF	12.04^{b}±0.54	12.01^{b}±0.71
T3= 50%RDF + 50%FYM	9.96^{c}±0.3	10^{c}±0.57
T4= 50%RDF + 50%Fly Ash	10.27^{c}±0.42	12.23^{b}±0.38
T5= 50%RDF + 50% Vermicompost	10.00^{c}±0.58	11.31^{bc}±0.47
T6=25%RDF + 25%FA + 50%FYM	14.25^{a}±0.48	15.16^{a}±0.6
T7=25%RDF + 50%FA + 25%VC	11.01^{bc}±0.51	11.9^{b}±0.32
T8=25%RDF + 25%FYM + 25%FA + 25%VC	15.02^{a}±0.27	15.5^{a}±0.5

The mean followed by different letters are significantly at p<0.05, according to DMRT (Duncan's Multiple Range Test) for separation of means. Note – T1 (Control), T2 (100%RDF), T3 (50%RDF + 50%FYM), T4 (50%RDF + 50%flyash), T5 (50%RDF + 50%Vermicompost), T6 (25%RDF + 25%FA + 50%FYM), T7 (25%RDF + 50%FA + 25%VC), T8 (25%RDF + 25%FYM + 25%FA + 25%VC).

Table.5 Effect of different organic and inorganic application on leaf length of sorghum

	1st cutting	2nd cutting
Treatment	**Leaf length**	**Leaf length**
T1= Control	27.73^{d}±0.37	37.55^{d}±0.29
T2= 100%RDF	34.59^{b}±0.56	44.82^{bc}±0.87
T3= 50%RDF + 50%FYM	31.33^{c}±0.88	44.22^{c}±0.86
T4= 50%RDF + 50%Fly Ash	33.57^{bc}±0.62	43.18^{c}±0.96
T5= 50%RDF + 50% Vermicompost	33.64^{bc}±0.32	43.98^{c}±0.58
T6=25%RDF + 25%FA + 50%FYM	37.4^{a}±1	46.76^{ab}±0.86
T7=25%RDF + 50%FA + 25%VC	32.91^{bc}±0.97	42.98^{c}±0.54
T8=25%RDF + 25%FYM + 25%FA + 25%VC	37.53^{a}±0.81	48.52^{a}±0.74

The mean followed by different letters are significantly at p<0.05, according to DMRT (Duncan's Multiple Range Test) for separation of means. Note – T1 (Control), T2 (100%RDF), T3 (50%RDF + 50%FYM), T4 (50%RDF + 50%flyash), T5 (50%RDF + 50%Vermicompost), T6 (25%RDF + 25%FA + 50%FYM), T7 (25%RDF + 50%FA + 25%VC), T8 (25%RDF + 25%FYM + 25%FA + 25%VC).

Table.6 Effect of different organic and inorganic application on plant population of sorghum

	1st cutting	2nd cutting
Treatment	**Plant population**	**Plant population**
T1= Control	160^{d}±0.33	153^{d}±0.88
T2= 100%RDF	173^{c}±1.73	173^{c}±1.73
T3= 50%RDF + 50%FYM	171^{c}±0.66	171^{c}±1.2
T4= 50%RDF + 50%Fly Ash	172^{c}±0.88	172^{c}±1.3
T5= 50%RDF + 50% Vermicompost	172^{c}±1.15	172^{c}±1.15
T6=25%RDF + 25%FA + 50%FYM	178^{ab}±1.2	1.78^{ab}±2.08
T7=25%RDF + 50%FA + 25%VC	174^{bc}±1.45	174^{bc}±1.45
T8=25%RDF + 25%FYM + 25%FA + 25%VC	180^{a}±1.73	180^{a}±2.02

The mean followed by different letters are significantly at p<0.05, according to DMRT (Duncan's Multiple Range Test) for separation of means. Note – T1 (Control), T2 (100%RDF), T3 (50%RDF + 50%FYM), T4 (50%RDF + 50%flyash), T5 (50%RDF + 50%Vermicompost), T6 (25%RDF + 25%FA + 50%FYM), T7 (25%RDF + 50%FA + 25%VC), T8 (25%RDF + 25%FYM + 25%FA + 25%VC).

Number of leaves (nos)

The number of leaves at 60 and 120 DAS significantly increased in treatment T8 (25% RDF + 25% FYM + 25% Flyash + 25% Vermicompost) as compared to control treatment. Integrated nutrient management proves to be best strategy to increase the plant height, number of leaves, leaf area and dry matter. Application of 50% RDF + 25% FYM + PSB help in increasing the grain and fodder yield as compared to other fertilizer (Shinde *et al.,* 2010).

Leaf length (cm)

The leaf length was observed at 60 and 120 DAS which showed that T8 (25% RDF + 25% FYM + 25% Flyash + 25% Vermicompost) treatment significantly increased leaf length as compared to control treatment. Number of leaves and leaf length were affected due to inorganic and organic manures. Treatment having combination of 50% vermicompost + 25% RDF + 25% FYM tend to give best result in term of growth characters as compared to control and 100% RDF (Verma *et al.*, 2012).

Plant population

Plant population was taken at first cutting and second cutting. The data collected showed that integrated nutrient character in treatment T8 (25% RDF + 25% FYM + 25% Flyash + 25% Vermicompost) prove to have maximum plant population as compared to control treatment. The treatment gave maximum plant population and lowest in control. Initial and final plant population of kharif season sorghum was recorded during two years. The result indicated that there was no significant difference in initial and final population with application of organic fertilizer and chemical fertilizer as treatments. During initial to final stage during crop growth period the plant population percentage reduced slightly (Olson *et al.,* 1990). Same results were observed by (Balasubramaian and Ramamoorthy, 1996).

In conclusion the application of different organic fertilizers along with combination of inorganic fertilizers proved to be best for significant increase in growth characters of sorghum crop as compared to control treatment. Integrated nutrient application to the soil provide better environment to the soil and have synergetic effect on the growth of sorghum crop. Integrated nutrient management provide better source of nutrient to the crop and has no adverse effect to the environment as well as on soil. Keeping in mind the term sustainable agriculture integrated nutrient management is the best way to achieve it. The production and sustaining the level of production are the key factor which can be only achieved only by integrated nutrient management.

References

Balasubramanian, A., and Ramamoorthy, K. 1996. Effect of nitrogen and phosphorus fertilization on juice yield and quality of sweet sorghum. *Madras Agricultural Journal*, *83*, pp. 464-464.

Bhalerao, G.A., A. Hamid and Bipte, A.R. 2001. Effect of integrated nutrient management with vermicompost on growth and yield of rainfed sorghum. *Annals of Plant Physiology*, *15* (2), pp.121-125.

Elawad, G.E., 2004. Effect of Chicken Manure and Urea Fertilizer on Growth and Yield of Teff Grass *(Eragrostisteff. zucc)* (Doctoral dissertation, M. Sc. Thesis. Faculty of Agriculture, University of Khartoum, Sudan).

Joshi, Y.P., S.S. Verma and Bhilare, R.L. 2007. Effect of zinc level on growth and yield of oat. Forage Res., 32 (4): 238-239.

Meena, R. M., R. C. Dhaker, B. P. Meenaand Jani P. P. 2013. Integrated nutrient management on growth parameters, chlorophyll content and nutrient uptake of sorghum. *Annals of Biology*.29 (3):317-319.

Mudalagiriyappa, B. K., H. V. Rama-chandrappa and Nanjappa, 2012. Moisture conservation practices and nutrient management on growth and yield of rabi sorghum (*Sorghum bicolor*) in the vertisols of peninsular India. *Agricultural Science*. 3 (4): 588-593.

Olson, A.J., J.K. Pataky, C.J. D'arcy and Ford R.E. 1990. Effects of drought stress and infection by maize dwarf mosaic virus on sweet corn. *Plant disease*, *74* (2), pp.147-151.

Patel, P.C., and Patel, J.C. 1994. Growth response, content and uptake of nutrients by different forage sorghum varieties (*Sorghum bicolor* (L) Moench) as influenced by nitrogen and zinc fertilization. *Gujarat Agricultural University Research Journal (India)*.

Raheja, P.C., 1966. Soil productivity and crop growth. *Soil productivity and crop growth.*

Sharnkumar, Merwade, Vishalkumar and Gnyandev. 2012. Effect of foliar application of plant nutrients on crop growth, flowering parameters and seed yield on sorghum hybrid cv. SHD-9704 (*Sorghum bicolor*), *International Journal Forestry Crop Improvement*, 3 (2): 86-91.

Shinde, B.A., J.P. Deshmukh, R.R. Nimbalkar and Ekatpure, S.M. 2010. Effect of integrated nutrient management and in situ moisture conservation studies in Kharif sorghum. *International Journal of Forestry and Crop Improvement*, *1* (2), pp.70-72.

Siddique, M., M.S. Bajwa and Makhdum, M.I. 1989. Yield and quality of maize fodder as influenced by different stages of harvesting and nitrogen rates. *Pakistan Journal of Scientific and Industrial Research (Pakistan)*.

Verma, S., M.R. Choudhary, B.L. Yadav and Jakhar, M.L. 2013. Influence of vermicompost and sulphur on growth and yield of garlic (*Allium sativum* L.) under semi-arid climate. *Journal of Spices and Aromatic Crops*, *22* (1), pp.20-23.

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