Effect of Different Organic and Inorganic Fertilizers on Growth and Yield Parameters of Maize (*Zea mays* L.)

Abstract

A field experiment was conducted during *summer* season of 2021-22 at Zonal Agriculture Research Station, Chhindwara, and analytical works were done in laboratories Department of Soil Science & Agricultural Chemistry, College of Agriculture, JNKVV, Jabalpur (MP). The objective of experiment was to find out the effect of different organic and inorganic fertilizers on growth parameters and yield of maize. The experiment was laid out in a randomized block design with ten treatments and three replications. The treatments were, T_1 - Control (0:0:0), T_2 - 100% RDF (120:60:40 kg NPK ha^{-1}), T_3 - 75% RDF, T_4 - 50 % RDF, T_5 - FYM 10 t ha^{-1} + Azotobacter, T_6 - 100 % RDF + 5 t ha^{-1} FYM, T_7 - 75 % RDF + 5 t ha^{-1} FYM, T_8 - 50 % RDF + 5 t ha^{-1} FYM, T_9 - 100 % RDF + 5 kg Zn ha^{-1} and T_{10} - FYM 5 t ha^{-1} (State practice). The result revealed that the application of Application of T_6 - 100 % RDF + 5 t ha^{-1} FYM was recorded higher values of all the growth parameters and yield of maize at harvest *viz*., plant height (212.22 cm), dry matter accumulation (296.15 g/plant), leaf area index (4.335 %), crop growth rate (CGR) (24.375), relative Growth Rate (RGR) (2.711), grain yield (7844.41 kg/ha) and stover yield (14223.98 kg/ha).

1. Introduction

The second half of the 20th century has seen continuous growth in global maize production and this has converted maize (*Zea mays* L.) into the leading global cereal in terms of production over the last decade. Maize offers an excellent opportunity for enhancing contribution to national food basket due to its high yielding potential and adaptability. In India, maize is the third most important cereal crop after rice and wheat as well in the word (Amanullah *et al.*, 2007 and Dilshad *et al.*, 2010). Maize provides food, feed, fodder and serves as a source of basic raw material for the number of industrial products *viz*., starch, protein, oil, alcoholic beverages, food sweeteners, cosmetics, more recently as bio-fuel, etc. No other cereal is being used in as many ways as maize. Maize grain has elevated nutritive value as it contains about 72% starch, 10% protein, 4.8% oil, 5.8% fiber and 3% sugar (Rafiq *et al.*, 2010). In India, the maize is used as human food (23%), poultry feed (51%), animal feed (12%), industrial (starch) products (12%), beverages and seed (1%). It represents 9.48 percent of total cereal production (Rice, Wheat,

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Maize, Bajra and Jowar). In India, it covers an area of 9.86 m ha with production of 32.42 million tonnes and productivity status of 3288.03 kg ha^{-1} contributing nearly 10.46 per cent in the national food basket (Department of Agriculture and Farmers Welfare, 2nd Advance estimation 2021-22). In Madhya Pradesh it is cultivated in an area of 1537.09 thousand ha with an average production of 4489.58 thousand tons and productivity of 2.92 tons/ha (Madhya Pradesh Economic Survey, 2020-21). It is predominantly cultivated as *kharif* crop in Chhindwara, Seoni, Betul, Barwani and Dhar districts of Madhya Pradesh. Maize is an exhaustive crop requires all types of macro and micro nutrients for better growth and yield potential. Therefore, it needs fertile soil to express its yield potential. The organic and inorganic refers "a system which aim to improve and maintain soil fertility for sustaining crop productivity and involves the use of chemical fertilizers in conjunction with organic manures which are rich input through biological process". In corporation of organic sources, *i.e.* farmyard manure (FYM) and bio-fertilizers such as Azotobactor along with chemical fertilizers, effective in increasing the nutrient availability in soil, improving physical properties of soil and its organic carbon status. In this endeavor proper balance of organic and inorganic fertilizer is important not only for increasing yield but also for sustaining soil health. Boosting yield, reducing production cost and improving soil health are three inter-linked components of the sustainable triangle. The integrated use of chemical and organic fertilizer on yield and yield components of maize is very crucial for assurance of food security (Sindhi *et al*., 2018 and Singh *et al*., 2018). For sustainable crop production and maintaining soil quality, input of organic manure is of major importance and should be advocated in the nutrient management of intensive cropping system for improving soil fertility and biological properties of soils (Khan and Wani, 2017).

Material and Methods

An investigation on the "Effect of Different Organic and Inorganic Fertilizers On Growth and Yield Parameters of Maize (*Zea mays* L.)" was conducted during *Summer* season of 2020-21 at Zonal Agriculture Research Station, Chhindwara, and analytical works were done in laboratories Department of Soil Science & Agricultural Chemistry, College of Agriculture, JNKVV, Jabalpur (MP). The objective of experiment was to find out the effect of different organic and inorganic fertilizers on growth and yield of Maize. The experiment was laid out in a randomized block design with ten treatments with three replications. The treatments were, T_1 - Control (0:0:0), T_2 - 100% RDF (120:60:40 kg NPK ha^{-1}), T_3 - 75% RDF, T_4 - 50 % RDF, T_5 - FYM 10 t ha^{-1} + Azotobacter, T_6 - 100 % RDF + 5 t ha^{-1} FYM, T_7 - 75 % RDF + 5 t ha^{-1} FYM, T_8 - 50 % RDF + 5 t ha^{-1} FYM, T_9 - 100 % RDF + 5 kg Zn ha^{-1}, T_{10} - FYM 5 t ha^{-1} (State practice). In addition to grain and straw yield, growth parameters were also recorded. The important findings of the investigation were reported and discussed below.

Result and Discussions

The growth attributing characters of maize were recorded periodically at an interval of 20 days from sowing date and are discussed below. The plant height was significantly influenced due to different treatments at all the growth stages of crop. The growth parameters at 30, 60, 90 DAS and at harvest were recorded and the rate of increased in plant height was very fast during 30-60 DAS, fast during 60-90 DAS and slow during and up to harvest. The effect of various nutrient treatments on plant height at different growth stages (30 DAS, 60 DAS, 90 DAS, and at harvest). At 30 DAS, the maximum plant height of 21.66 cm was observed in T_6 (100% RDF + 5 t ha^{-1} FYM), which was statistically at par with T_9 (100% RDF + 5 kg Zn ha^{-1}, 20.95 cm) and T_7 (75% RDF + 5 t ha^{-1} FYM, 20.67 cm). The lowest plant height (15.20 cm) was recorded in the control treatment (T_1), highlighting the significant impact of nutrient application at early growth stages. At 60 DAS, the tallest plants were again observed in T_6 (100% RDF + 5 t ha^{-1} FYM, 42.18 cm), statistically similar to T_9 (100% RDF + 5 kg Zn ha^{-1}, 41.96 cm), T_7 (75% RDF + 5 t ha^{-1} FYM, 41.67 cm), and T_2 (100% RDF, 41.18 cm). The shortest plants were found in control treatment (T_1, 27.97 cm), which confirms the need for nutrient supplementation to enhance plant growth. At 90 DAS, the highest plant height of 89.01 cm was recorded in T_6 (100% RDF + 5 t ha^{-1} FYM), statistically at par with T_9: 100% RDF + 5 kg Zn ha^{-1} (87.53 cm), T_7: (75% RDF + 5 t ha^{-1} FYM (86.63 cm), and T_2: (100% RDF (85.23 cm). The lowest plant height was observed in T_1: control treatment (58.28 cm), indicating the substantial effect of integrated nutrient management on plant development during this critical phase. At harvest, the tallest plants were observed in T_6 (100% RDF + 5 t ha^{-1} FYM, 212.22 cm), which was statistically at par with T_9: 100% RDF + 5 kg Zn ha^{-1} (211.13 cm), T_7: (75% RDF + 5 t ha^{-1} FYM (196.74 cm). The smallest plants were again recorded in the control treatment (T_1, 154.34 cm), reflecting the long-term benefits of balanced nutrient application in achieving optimal growth. Overall, T_6 (100% RDF + 5 t ha^{-1} FYM) consistently produced the highest plant height at all growth stages, highlighting the synergistic benefits of combining inorganic and organic fertilizers. Treatments T_9 (100% RDF + 5 kg Zn ha^{-1}), T_7 (75% RDF + 5 t ha^{-1} FYM), and T_2 (100% RDF) also performed well and were statistically at par with the best treatment at most stages, making them viable alternatives. On the other hand, the control treatment (T_1) consistently showed the lowest plant height across all growth stages, emphasizing the critical role of proper nutrient management in promoting plant growth and development.

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Similar result reported by Verma *et al*. (2016), Panwar (2008), Singh *et al*., (2019) and Barde *et al*., (2021).

On dry matter accumulation (g/plant) demonstrate the significant impact of various nutrient treatments at different growth stages (30 DAS, 60 DAS, 90 DAS, and at harvest). At 30 DAS, the highest dry matter accumulation of 22.25 g/plant was observed in T_6 (100% RDF + 5 t ha^{-1} FYM), which was statistically at par with T_9 (100% RDF + 5 kg Zn ha^{-1}, 21.65 g/plant), T_7 (75 % RDF + 5 t ha^{-1} FYM, 20.25 g/plant) and T_2: 100% RDF (120:60:40 kg NPK/ha), 20.07 g/plant. The lowest dry matter accumulation was recorded in T_1 (Control) at 16.33 g/plant, indicating the importance of nutrient supplementation during early growth. At 60 DAS, T_6 (100% RDF + 5 t ha^{-1} FYM) again achieved the highest dry matter accumulation (62.12 g/plant), which was statistically at par with T_9: 100% RDF + 5 kg Zn ha^{-1} (61.46 g/plant), T_7 (75% RDF + 5 t ha^{-1} FYM, 54.63 g) and T_2 (100% RDF, 53.11 g). The lowest accumulation was in T_1: control (41.06 g/plant), showing a clear response to applied nutrients. At 90 DAS, the maximum dry matter accumulation of 108.52 g/plant was observed in T_6 (100% RDF + 5 t ha^{-1} FYM), which was statistically at par with T_9: 100% RDF + 5 kg Zn ha^{-1} (107.80 g), T_7 (75% RDF + 5 t ha^{-1} FYM, 100.65 g) and T_2 (100% RDF, 97.94 g) also performed well and were significantly better than other treatments. The lowest accumulation was again seen in T_1 (Control) (66.55 g), highlighting the need for an integrated nutrient management approach during this critical stage of crop growth. At harvest, T_6 (100% RDF + 5 t ha^{-1} FYM) exhibited the highest dry matter accumulation (296.15 g/plant), which was statistically at par with T_9: 100% RDF + 5 kg Zn ha^{-1} (276.76 g). The control treatment (T_1) had the lowest dry matter accumulation (174.83 g/plant), emphasizing the long-term benefits of balanced nutrient application for plant biomass production. In short, T_6 (100% RDF + 5 t ha^{-1} FYM) consistently resulted in the highest dry matter accumulation across all growth stages, reflecting the synergistic effects of combining organic and inorganic fertilizers. Treatments such as T_9 (100% RDF + 5 kg Zn ha^{-1}), T_7 (75% RDF + 5 t ha^{-1} FYM), and T_2 (100% RDF) also achieved statistically similar results to T_6 (100% RDF + 5 t ha^{-1} FYM), providing viable alternatives for optimizing dry matter accumulation. The control treatment (T_1) consistently exhibited the lowest accumulation, highlighting the necessity of adequate nutrient management for enhancing plant growth and productivity. Similar result reported by Kumar *et al*. (2005), Singh and Nepalia (2009), Srinivasarao *et al*. (2010), Singh *et al*., (2019) and Barde *et al*., (2021).

The leaf area index (LAI) reveal the significant impact of different nutrient treatments on plant canopy development at various growth stages (30 DAS, 60 DAS, and 90 DAS). At 30 DAS, the highest LAI of 1.168 was observed in T_6 (100% RDF + 5 t ha^{-1} FYM), which was statistically

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at par with T_9 (100% RDF + 5 kg Zn ha^{-1}, 1.152). The lowest LAI was recorded in T_1 (Control, 0.407), highlighting the early-stage benefits of nutrient application for promoting canopy development. At 60 DAS, T_6 (100% RDF + 5 t ha^{-1} FYM) again achieved the maximum LAI (3.138), which was statistically at par with T_9 (100% RDF + 5 kg Zn ha^{-1}, 2.996), T_7 (75% RDF + 5 t ha^{-1} FYM, 2.883). The lowest LAI was observed in T_1 (Control, 1.762), indicating the need for proper nutrient management to optimize leaf area during mid-growth stages. At 90 DAS, the highest LAI of 4.3346 was recorded in T_6 (100% RDF + 5 t ha^{-1} FYM), which was statistically at par with T_9 (100% RDF + 5 kg Zn ha^{-1}, 4.288) and T_7 (75% RDF + 5 t ha^{-1} FYM, 3.9284). The lowest LAI was again observed in T_1 (control, 3.032), emphasizing the importance of integrated nutrient management in maintaining canopy structure during the later stages of crop growth. Overall, T_6 (100% RDF + 5 t ha^{-1} FYM) consistently recorded the highest LAI across all growth stages, reflecting the synergistic effects of combined organic and inorganic fertilizers in enhancing leaf area development. Treatments T_9 (100% RDF + 5 kg Zn ha^{-1}) and T_7 (75% RDF + 5 t ha^{-1} FYM) performed statistically at par with T_6 (100% RDF + 5 t ha^{-1} FYM) in most stages and can serve as effective alternatives. The consistently low LAI values in T_1 (Control) highlight the critical role of balanced and integrated nutrient management in achieving optimal leaf area and overall plant growth. Similar result reported by Kumar *et al*. (2005), Singh and Nepalia (2009), Singh *et al*., (2019) and Barde *et al*., (2021).

The crop growth rate (CGR) indicate the significant impact of different nutrient management practices during two critical growth periods, 30-60 DAS and 60-90 DAS. During the 30-60 DAS period, the highest CGR of 21.711 g/day was observed in T_6 (100% RDF + 5 t ha^{-1} FYM), which was statistically at par with T_9 (100% RDF + 5 kg Zn ha^{-1}, 20.750 g/day). The lowest CGR was recorded in T_1 (Control, 13.671 g/day), highlighting the importance of proper nutrient application during early vegetative growth. During the 60-90 DAS period, T_6 (100% RDF + 5 t ha^{-1} FYM) again recorded the maximum CGR of 24.375 g/day, at par with T_9 (100% RDF + 5 kg Zn ha^{-1}, 24.055 g/day) and T_7 (75% RDF + 5 t ha^{-1} FYM, 22.617 g/day). The lowest CGR during this period was observed in T_1 (control, 14.171 g/day), underscoring the need for adequate nutrient supply to sustain rapid growth during this critical stage. Overall, T_6 (100% RDF + 5 t ha^{-1} FYM) consistently achieved the highest CGR during both growth periods, showcasing the effectiveness of combining organic and inorganic nutrient sources. Treatments T_9 (100% RDF + 5 kg Zn ha^{-1}) and T_7 (75% RDF + 5 t ha^{-1} FYM) performed comparably to T_6 (100% RDF + 5 t ha^{-1} FYM), providing suitable alternatives for nutrient management. The significantly lower CGR values observed in T_1 (Control) emphasize the crucial role of balanced nutrient application in

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promoting optimal growth rates throughout the crop lifecycle. Similar result reported by Singh and Nepalia (2009), Singh *et al*., (2019) and Barde *et al*., (2021).

The relative growth rate (RGR) highlights the significant influence of nutrient management practices during the crop's key growth phases, 30-60 DAS and 60-90 DAS. During the 30-60 DAS period, the highest RGR of 0.090 g/g/day was recorded in T_6 (100% RDF + 5 t ha^{-1} FYM), which was statistically at par with T_9 (100% RDF + 5 kg Zn ha^{-1}, 0.084 g/g/day). The lowest RGR was observed in T_1 (Control, 0.030 g/g/day), underscoring the need for integrated nutrient management to enhance relative growth during the vegetative phase. In the 60-90 DAS period, T_6 (100% RDF + 5 t ha^{-1} FYM) maintained the highest RGR of 2.711 g/g/day, followed by T_9 (100% RDF + 5 kg Zn ha^{-1}, 2.601 g/g/day). Treatments such as T_7 (75% RDF + 5 t ha^{-1} FYM, 2.537 g/g/day) and T_2 - 100% RDF (2.443 g/g/day) also performed significantly better than the control. The lowest RGR during this period was again recorded in T1 (control, 2.028 g/g/day), emphasizing the importance of balanced fertilization to sustain higher growth rates during the reproductive stage. In short, T_6 (100% RDF + 5 t ha^{-1} FYM) consistently achieved the highest RGR during both growth phases, demonstrating the benefits of integrating organic and inorganic nutrient sources. Treatments T_9 (100% RDF + 5 kg Zn ha^{-1}) and T_7 (75% RDF + 5 t ha^{-1} FYM) performed comparably, indicating their effectiveness as alternatives. The lowest RGR observed in T_1 (Control) further highlights the critical role of appropriate nutrient management in maintaining optimal growth rates during the crop's lifecycle. Similar result reported by Singh *et al*., (2019) and Barde *et al*., (2021).

The grain and stover yield results provide critical insights into the effectiveness of various nutrient management practices. For grain yield, the highest yield of 7844.41 kg/ha was achieved with T_6 (100% RDF + 5 t ha^{-1} FYM), which was statistically at par with T_9 (100% RDF + 5 kg Zn ha^{-1}, 7448.94 kg/ha), T_2 (100% RDF, 7215.97 kg/ha) and T_7 (75% RDF + 5 t ha^{-1} FYM, 6955.89 kg/ha). On the other hand, the lowest grain yield was observed in T_1 (Control, 5291.69 kg/ha), highlighting the necessity of nutrient application for optimal crop productivity. For stover yield, the highest yield of 14,223.98 kg/ha was recorded in T_6 (100% RDF + 5 t ha^{-1} FYM), which was statistically at par with T_9 (100% RDF + 5 kg Zn ha^{-1}, 13219.09 kg/ha), T_2 (100% RDF, 12753.78 kg/ha) and T_7 (75% RDF + 5 t ha^{-1} FYM, 12476.18 kg/ha). The lowest stover yield was recorded in T_1 (control, 9805.76 kg/ha), further emphasizing the importance of integrated nutrient management in achieving higher biomass production. Overall, T_6 (100% RDF + 5 t ha^{-1} FYM) emerged as the most effective treatment for maximizing both grain and stover yields. T_9 (100% RDF + 5 kg Zn ha^{-1}) was comparable, showcasing the benefits of micronutrient supplementation.

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Treatments like T_2 (100% RDF) and T_7 (75% RDF + 5 t ha^{-1} FYM) also performed significantly better than the control, providing viable alternatives. The consistently lower yields in T_1 (Control) underscore the essential role of balanced fertilization in improving crop productivity. Similar result reported by Singh *et al*., (2019) and Barde *et al*., (2021) and Yari *et al*., (2023).

Conclusion

Application of T_6 (100% RDF + 5 t ha^{-1} FYM) is the most effective treatment for optimizing growth parameters, yield attributes, and overall productivity of maize, making it the recommended nutrient management practice. Treatments such as T_9 (100% RDF + 5 kg Zn ha^{-1}) and T_7 (75% RDF + 5 t ha^{-1} FYM) serve as viable alternatives for achieving high yields, especially where resource constraints exist. The study underscores the importance of integrated nutrient management in sustainable agriculture, promoting both crop productivity and soil health. Above conclusion are based on single season research finding and it needs further confirmation by repeating the trial for at least one more season.

References

Agricultural Statistics. (2012). Directorate of Economics and Statistics, *Government of India*.

Amanullah, M.M., K. Vaiyapuri, K. Satyamoorthi, S. Pazhanivelan and A. Alagesan. 2007. Nutriient uptake, tuber yield of cassava (*Manihot esculenta* crentz) and soil fertility as influenced by organic manures. *J. Agronomy*., 6(1): 183-187.

Barde, B., Sasode, D. S., Joshi, E., Singh, V. and Patel R. (2021). Effect of integrated nutrient management on growth, yield attributes and yield of sweet corn under northern tract condition of Madhya Pradesh. *Prog. Agric*. 21 (2): 196-200 (2021).

Dilshad, M. D., Lone, M. I., Jilani, G., Malik, M. A., Yousaf, M., Khalid, R., Shamim, F. (2010). Integrated plant nutrient management (IPNM) B on maize under rainfed condition. *Pakistan Journal of Nutrition*. 9(9), 896-901.

Khan, A. M. and Wani, F. S. (2017). Effect of INM on soil carbon pools in Rice – Oil seed cropping system under temperature condition of Kashmir Vally. *Int. J. Pure App. Biosci*. 5(6): 611-621.

UNDER PEER REVIEW

Kumar Ashok, Gautam RC, Singh R, Rana KS. Growth, yield and economics of maize (*Zea mays*) - wheat (*Triticum aestivum*) cropping sequence as influenced by integrated nutrient management. *Indian Journal of Agricultural Science*. 2005; 75(11):709-711.

Panwar A.S. (2008). Effect of integrated nutrient management in maize (*Zea mays*) - mustard (*Brassica compestris* var toria) cropping system in mid hills altitude. *The Indian Journal of Agricultural Sciences*. 78(1):27-31.

Rafiq UA, Sattar S, Ahmad S, Mahmood MM. Overwintering Population of Maize Stem Borer *Chilo partellus* (Swinhoe) at high altitudes of Kashmir. *Journal of Biological Science*. 2010; 2(1):18-24.

Sindhi, S. J., Thanki, J. D., Desai, L. J. (2018). A review on integrated nutrient management (INM)approach for maize. *Journal of Pharmacognosy and Phytochemistry*. 7(4): 3266-69.83.

Singh, A. K., Kumar, A., Ray, P. K. (2018). Impact of organic manures and bio-fertilizers on growth, flowering, fruiting, yield and quality of Tomato (*Solanum Lycopersicon* Mill). *International Journal of Current Microbiology and Applied Sciences*. 7(10), 2180-2187.

Singh, D and Nepalia, V. (2009). Influence of integrated nutrient management on quality protein maize (*Zea mays*) productivity and soils of southern Rajasthan. *Indian Journal of Agricultural Sciences*. 79 (12): 1020-2.

Singh, J. K., Bhatnagar, A., Prajapati, B. K. And Pandey, D. (2019). Influence of integrated nutrient management on the growth, yield and economics of sweet corn (*Zea mays* saccharata) in spring season. *Pantnagar Journal of Research*. 17(3): 214-118.

Srinivasarao, Ch., Ali, M., Venkateswarlu, S., Rupa, T. R., Singh, K. K., Kundu S. and Prasad J.V.N.S. (2010). Direct and residual effects of integrated sulphur fertilization in maize (*Zea mays*)- chickpea (*Cicer arietinum*) cropping system on Typic Ustochrept. *Indian Journal of Agronomy*. 55 (4): 259-26.

Verma, R. (2016). Effect of long term application of fertilizer and manure on physiological, biochemical attributes, yield and quality of soybean grown on Vertisol. *M.Sc. Thesis, JNKKV*. (84).

UNDER PEER REVIEW

Yari, J., Doruk, K., Rupok, B., Ramamoorthy, P., Venu, N., Sindhu, G. P. (2023). Maize Yield Response to Organic Fertilizers and Biofertilizers in a Sub-Tropical Zone of Eastern Himalayan Region of Arunachal Pradesh, India. *Int. J. Plant Soil Sci*. 35(23):401-6. https://journalijpss.com/index.php/IJPSS/article/view/4255

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Table 1: Effect of organic and inorganic fertilizers on growth parameters in maize crop (2021-22)

Treatments	Plant height (cm)				Dry Matter Accumulation (g/Plant)				Leaf area index		
	30 DAS	60 DAS	90 DAS	At harvest	30 DAS	60 DAS	90 DAS	At harvest	30 DAS	60 DAS	90 DAS
Control (0:0:0) (T_1)	15.20	27.97	58.28	154.34	16.33	41.06	66.55	174.83	0.4068	1.7616	3.0321
100% RDF (T_2)	20.33	41.18	85.23	188.80	20.07	53.11	97.94	240.08	0.9444	2.8245	4.1701
75% RDF (T_3)	19.22	36.10	80.67	188.93	19.75	51.49	90.79	208.28	0.8370	2.7320	3.6972
50 % RDF (T_4)	17.10	31.20	69.95	178.18	18.73	48.94	83.80	191.15	0.6000	2.5908	3.4763
FYM 10 t/ha + Azotobacter (T_5)	16.76	29.75	66.30	170.50	17.86	45.97	75.95	188.42	0.5798	2.4470	3.2159
100 % RDF + 5 t/ha FYM (T_6)	21.66	42.18	89.01	212.22	22.25	62.12	108.52	296.15	1.1681	3.1381	4.3346
75 % RDF + 5 t/ha FYM (T_7)	20.67	41.67	86.63	196.74	20.25	54.63	100.65	250.71	0.9936	2.8830	3.9284
50 % RDF + 5 t/ha FYM (T_8)	17.55	35.49	78.22	181.42	19.23	49.82	85.14	206.54	0.8004	2.6994	3.9684
100 % RDF + 5 kg Zn/ha (T_9)	20.95	41.96	87.53	211.13	21.65	61.46	107.80	276.76	1.1515	2.9964	4.2880
FYM 5 t/ha (State practice) (T_{10})	15.99	29.72	65.84	167.55	16.58	42.12	70.26	182.52	0.5432	2.3905	3.0835
SE (m)	**0.69**	**1.35**	**3.01**	**6.98**	**0.82**	**1.88**	**4.56**	**7.43**	**0.0308**	**0.1031**	**0.1692**
CD P= 0.05	**2.06**	**4.00**	**8.93**	**20.74**	**2.43**	**5.59**	**13.55**	**22.07**	**0.0915**	**0.3063**	**0.5026**

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Table 2: Effect of organic and inorganic fertilizers on growth parameters and yield attributes in maize crop (2021-22)

Treatments	Crop growth rate		Relative growth rate		Grain Yield (kg/ha)	Stover Yield (kg/ha)
	30-60 DAS	60-90 DAS	30-60 DAS	60-90 DAS		
Control (0:0:0) (T_1)	13.671	14.171	0.030	2.028	5291.69	9805.76
100% RDF (T_2)	18.499	21.598	0.070	2.443	7215.97	12753.78
75% RDF (T_3)	18.210	20.485	0.065	2.389	6308.43	11702.50
50 % RDF (T_4)	16.284	17.888	0.058	2.261	6031.13	11363.23
FYM 10 t/ha + Azotobacter (T_5)	15.293	16.644	0.055	2.169	5854.49	11085.33
100 % RDF + 5 t/ha FYM (T_6)	21.711	24.375	0.090	2.711	7844.41	14223.98
75 % RDF + 5 t/ha FYM (T_7)	19.401	22.617	0.072	2.537	6955.89	12476.18
50 % RDF + 5 t/ha FYM (T_8)	17.653	19.589	0.060	2.343	6810.90	12354.52
100 % RDF + 5 kg Zn/ha (T_9)	20.750	24.055	0.084	2.601	7448.94	13219.09
FYM 5 t/ha (State practice) (T_{10})	14.245	15.610	0.040	2.092	5499.60	10314.41
SE (m)	**0.768**	**0.853**	**0.003**	**0.031**	**422.23**	**671.06**
CD P= 0.05	**2.280**	**2.533**	**0.009**	**0.092**	**1254.33**	**1993.52**

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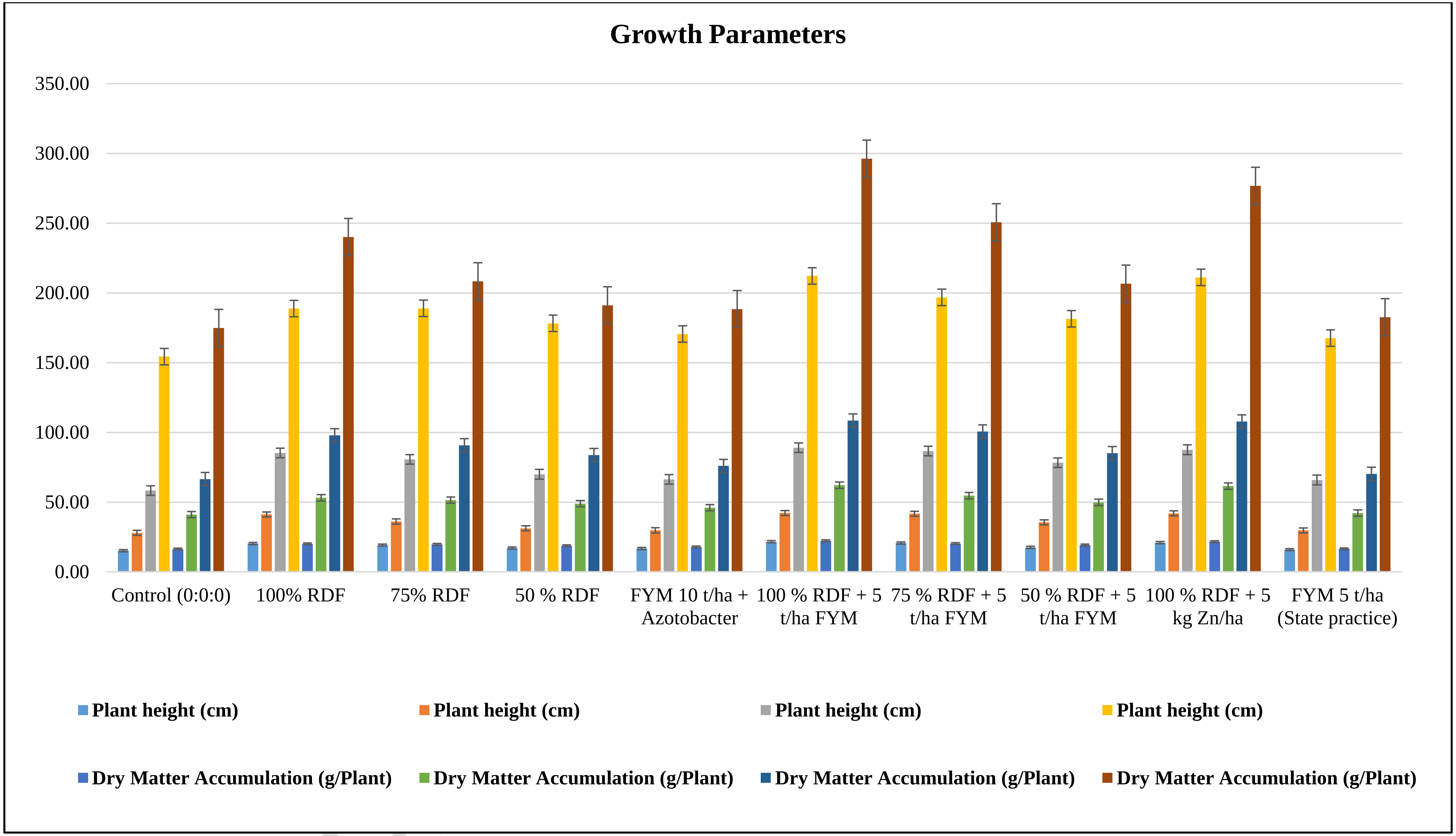

Figure 1: Growth parameters of maize as influenced by different treatments

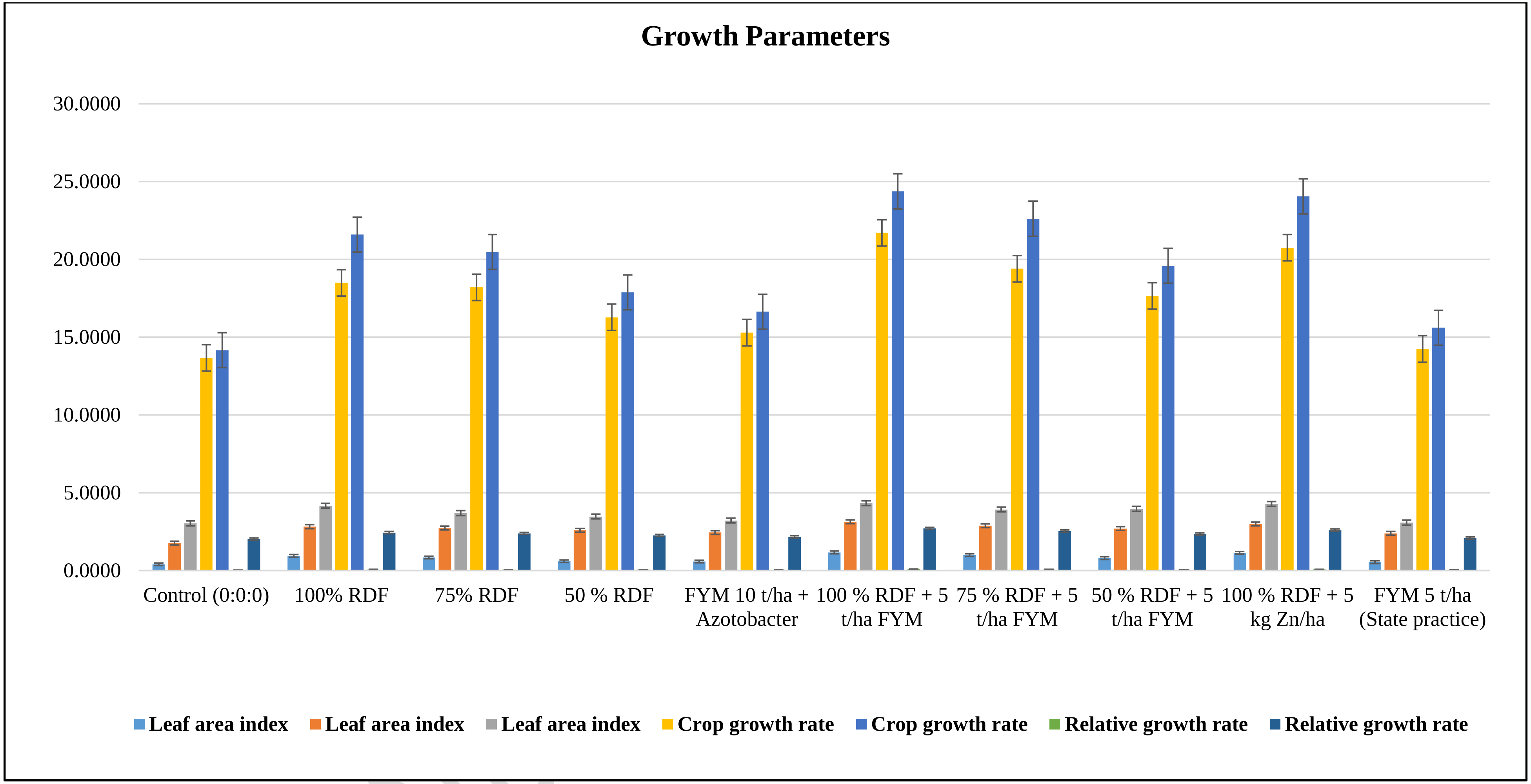

Figure 2: Growth parameters of maize as influenced by different treatments

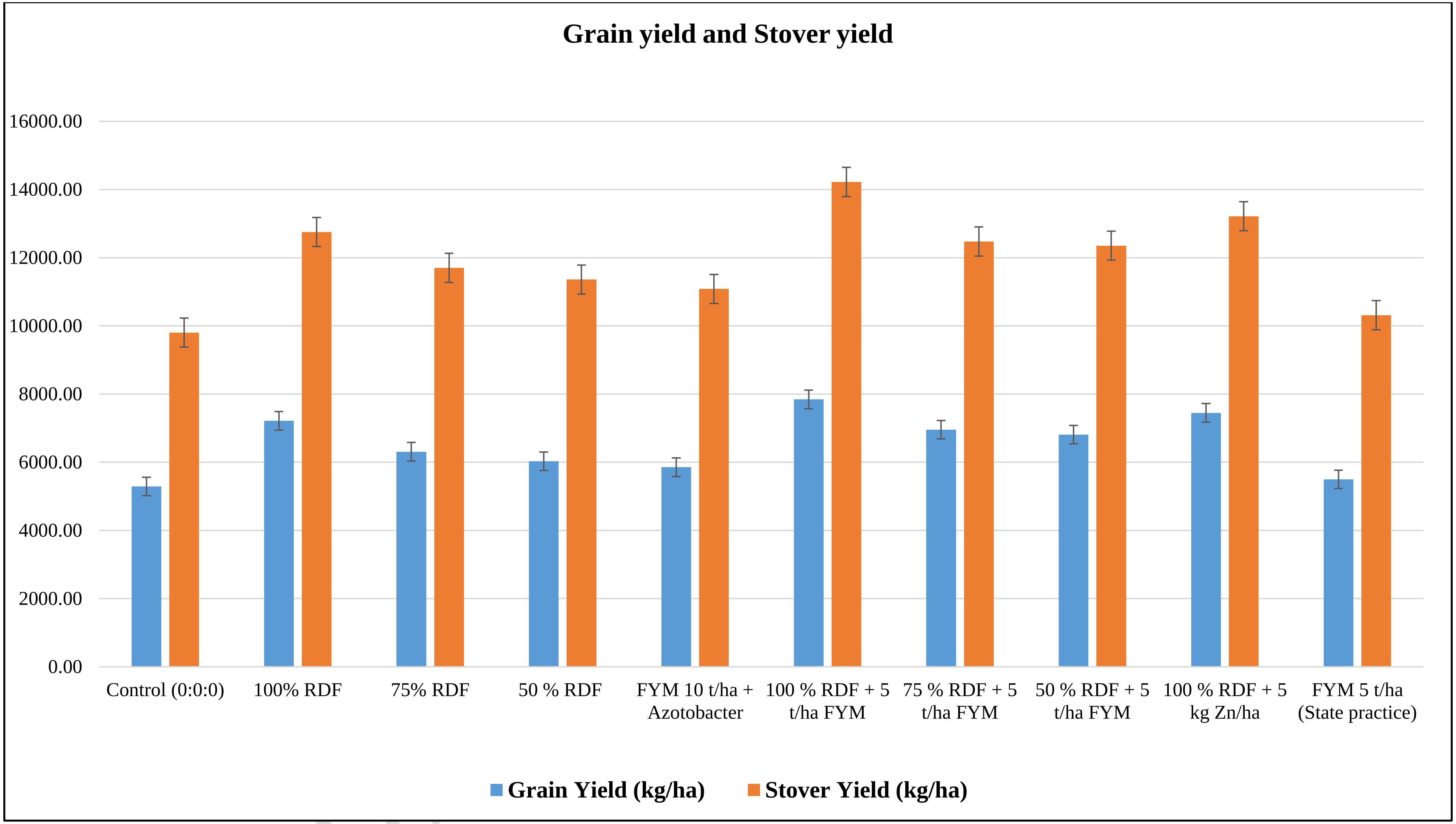

Figure 3: Grain and stover yield of maize as influenced by different treatments