Archives of Agriculture and Environmental Science, 6(4): 528-534 (2021)
https://doi.org/10.26832/24566632.2021.0604015

e-ISSN: 2456-6632

This content is available online at AESA

Archives of Agriculture and Environmental Science

Journal homepage: journals.aesacademy.org/index.php/aaes

ORIGINAL RESEARCH ARTICLE

Effect of different fertilizer doses on the production of Chaite-5 paddy variety in Dhanusha District, Nepal

Bhushan Adhikari[1*], Abichal Poudel[1], Karuna Kafle[1], Santosh K. Yadav[1], Rashil Gelal[1] and Biplov Oli[2]

[1]G.P Koirala College of Agriculture and Research Centre, Morang, NEPAL
[2]Asst. Lecturer, G.P Koirala College of Agriculture and Research Centre, Morang, NEPAL
[*]Corresponding author's E-mail: bhushan.adhakari@gmail.com

ARTICLE HISTORY

Received: 14 October 2021
Revised received: 05 December 2021
Accepted: 17 December 2021

Keywords

Effect
Fertilizers
Growth
Production
Spikelet

ABSTRACT

The application of inorganic nutrient sources is necessary for proper agricultural growth that can ensure high quality food production. A field experiment was carried out in Hansapur, Dhanusha from March 2021 to July 2021 to study the effect of different fertilizer doses on the growth and yield of rice. The experiment was set up in a randomized complete block design (RCBD) with 7 different treatments following three replications. The treatments were named as T1: Control, T2: RDF (Recommended dose of fertilizers - 100:30:30 kg NPK/ha), T3: Double dose of RDF (200: 60: 60 kg NPK/ha), T4: A half dose of RDF (50: 15: 15 kg NPK/ha), T5: 125% dose of RDF (125: 37.5: 37.5 kg NPK/ha), T6: Locally available Azolla (300 kg/ha), and T7: FYM (6 ton/ha), respectively. Different doses of RDF showed a significant effect on growth, yield, and yield contributing characters of Chaite-5 variety. Results of the study showed that the application of a double dose of RDF (200: 60: 60 kg NPK/ha) gave the maximum yield (9.50 ton/ha). It was also recorded that 125% dose of RDF, recommended dose of fertilizers and FYM gave satisfactory results. Results revealed that the highest plant height, effective tillers/hill, panicle number, panicle length, total spikelet/hill, 1000-grain weight, grain yield, and straw yield were obtained from the use of a double dose of RDF (200: 60: 60 kg NPK/ha). It was observed that yield of rice can be increased substantially with the application of higher doses of nitrogenous fertilizers. Hence, a double dose of fertilizer can be the best supplement for improving growth and yield in rice.

Citation of this article: Adhikari, B., Poudel, A., Kafle, K., Yadav, S. K., Gelal, R., & Oli, B. (2021). Effect of different fertilizer doses on the production of Chaite-5 paddy variety in Dhanusha District, Nepal. *Archives of Agriculture and Environmental Science*, *6*(4), 528-534, https://dx.doi.org/10.26832/24566632.2021.0604015

INTRODUCTION

Rice (*Oryza sativa* L.) is the main cereal crop for most of the world's population and ninety percent is produced and consumed in Asia only (FAO, 2013). Agriculture in Nepal provides one-third of gross domestic product (GDP) and more than 60% of the population are engaged in the agricultural sector, among which rice contributes 21% to agricultural GDP (MoF, 2016). The current rice production is insufficient to feed the increasing population of the country. As, the expansion of cultivable land is not possible so, vertical increase in yield should be emphasized to meet the demand for food in the country (Meena *et al*., 2015). The rice production in Nepal must be increased by over 6.0 million tons by 2020 to meet the growing demand of the increasing population (Kharel *et al*., 2018).

Among the major nutrients, Nitrogen (N) plays a very important role in increasing the grain yield under lowland and has been considered as a major limiting nutrient (Moro *et al*., 2015). Application of nitrogen as urea improves rice yield and urea is a very effective nitrogenous fertilizer throughout the rice-growing regions. The application of a lower dose of N may lead to poor grain in rice and higher doses give diminishing returns of

crop yields to N input (Yousaf *et al.*, 2016). The optimum dose of N not only refers to the rate of application but also the proper timing of its application in combination with a balanced dose (Sultana *et al.*, 2015). The haphazard application of nitrogen fertilizer causes environmental pollution and judicious application of fertilizer is the most effective way for maximum yield of rice. So, it is necessary to use appropriate amount of nitrogen fertilizer for efficient management and better yield of rice. The use of organic manures along with chemical fertilizers may be the effective way of improving the crop yield in a sustainable way. So, the study aims at finding out the most effective dose of organic and inorganic sources of fertilizers to improve the yield and yield attributing characteristics of rice.

MATERIALS AND METHODS

Experimental site

The experiment was conducted in the research field of Rice Zone, Dhanusha which is located 14 km northeast of Janakpur, the district headquarters of Dhanusha, in the inner terai region of Nepal. The experimental site lies at 26°46' N latitude and 86° 32' E longitude and the altitude are 84 masl. It has a humid and subtropical climate with cool winter (2-3°C) and hot summer (39°C). The annual rainfall is about 1367 mm with a distinct monsoon period from mid-June to mid-September. The soil in the research area is sandy loam and is slightly acidic.

Meteorological data

The meteorological data such as maximum and minimum temperature (°C), precipitation (mm), and relative humidity (%) during the entire crop growing season (March to July 2020) of the experimental site (Hansapur, Dhanusha) were noted from NASA POWER website (https://power.larc.nasa.gov/data-access-viewer/).

Soil analysis

The physio-chemical analysis of soil was carried out before transplanting of rice on research field in Project Implementation Unit (PIU) Office, Dhanusha with the help of the soil kit method. The soil of the research field was sandy loam, slightly acidic (pH: 6.4), low nitrogen content, high phosphorus content, and medium potash content.

Variety selection

Chaite- 5 variety of rice was selected for the study. The variety is resistant to BLB, blast, and major pests of rice. Its maturity duration is about 120-125 days and the average yield potential is 4-6 ton/ha. The grain is finer, soft, and tasty while compared with other Chaite rice varieties.

Experimental design

The experiment was laid out in a Randomized Complete Block Design (RCBD) with 7 treatments including control following 3 replications. The individual plot was a square block of size $4m^2$ (2m × 2m) with a total experimental area covering 190 m^2 (10 m × 19 m). The spacing between the two treatment plots was 0.5 m and spacing between the two replication block was 1m. Each experimental plot has 144 plants with 12 rows and 12 columns spaced at 15*15 cm. The sample (10 hills) was selected randomly from each plot for data measurement and plots and bunds were kept at 0.5m spacing.

Treatment details

Seven different treatments were used during the study and the detail of the treatment is given in Table 1.

Biometric observation

Data were taken from 10 randomly selected hills at 25^{th}, 50^{th}, and 75^{th} days after transplanting (DAT) and at harvest, i.e., at 90^{th} day. Growth parameter, yield, and yield attributes were recorded before and after harvesting as required. The parameters recorded for growth and yield attributes are enlisted in the Table 2.

Growth attributes

Plant height (cm), total number of the tillers per hill, number of effective and non-effective tillers per hill from 10 tagged hills were recorded at 25, 50, 75^{th} days after transplanting and at harvest.

Yield attributes

The number of panicles, panicle length (cm), total spikelet per hill, weight of total spikelet per hill (g) was recorded from randomly selected 10 plants at harvest and their average was calculated. Also, 1000 grain weight (g) from the threshed and cleaned

Table 1. Treatments used during the study.

S.N.	Treatments	Symbol	Dose
1	Control	T_1	Without any treatment
2	Recommended dose of fertilizers (RDF)	T_2	100: 30: 30 kg NPK/ha
3	Double dose of RDF	T_3	200: 60: 60 kg NPK/ ha
4	Half dose of RDF	T_4	50: 15: 15 kg NPK/ ha
5	125% dose of RDF	T_5	125: 37.5: 37.5 kg NPK/ ha
6	Locally available *Azolla*	T_6	300 kg/ ha
7	Farmyard manure (FYM)	T_7	6 ton/ ha

plants of each plot was weighed and expressed in gram. Similarly, the biological yield after the grains were separated manually from tagged plants of each plot was weighted to measure the straw yield in kg and was computed to ton/ ha.

Statistical analysis

The data was entered in chronological order for replication and treatment blocks in Microsoft Excel (2013) program and were subjected to ANOVA with the help of R-Studio (R-win Version 3.6.2 and R-studio Version 1.2.5033, Statistical data analysis packages including core R team 2019). The tables, charts, and graphs were constructed by using Microsoft Excel (2013).

RESULTS AND DISCUSSION

Plant height

The effect of different treatments on plant height at 25, 50, and 75 days after transplanting (DAT) and at harvest is presented in Table 3. The study shows that there was rapid increase in plant height on applying different treatments up to 50 DAT and it was increased gradually and reached maximum at flowering and harvesting stage. Different doses of NPK fertilizers and bio-fertilizer significantly affected the plant height throughout the growing period. The application of double dose of fertilizers (200: 60:60 kg NPK/ ha) on rice plant has shown the maximum plant height at all stages including harvest (100.16 cm) and the lowest plant height (75.76 cm and 75.93cm) was attained by the plant on application of FYM (6 ton/ha) and control respectively. This result corresponds with the findings of Jeremie *et al.* (2011), who reported the increase in vegetative growth of rice on applying higher doses of nitrogenous fertilizer. Results of the study also reports that the maximum plant height (85.60 cm), was attained by the application of *Azolla* (300 kg/ ha) among bio-organics which was significantly higher than the other bio-organic treatments (FYM) at all stages of crop growth. Oladele and Awodum (2014) also reported that the application of bio fertilizer to rice increases the growth parameters such as the number of leaves of a rice plant which is a very significant component in the production of rice.

No. of tillers per hill

Results of the study revealed that the total number of tillers/hill increased considerably from 25 to 50 DAT and after that, a gradual decline was observed from 75 DAT and to harvest stage

Table 2. Parameters recorded for growth and yield attributes of rice.

S.N.	Growth and yield attributes:
1	Plant height
2	Total number of tillers per hill
3	Number of effective tillers per hill
4	Number of non-effective tillers per hill
5	Number of panicles
6	Panicle length (cm)
7	Total spikelet per hill
8	Weight of total spikelet per hill (gm)
9	1000 grain weight (gm)
10	Grain yield (ton/ ha)
11	Straw yield (ton/ ha)

Table 3. Effect of different doses of fertilizers on plant height at different growth stages of rice.

Treatment	Plant height			
	25 DAT	50 DAT	75 DAT	At harvest
Control	33.20^{d}	51.56^{cd}	73.73^{cd}	75.93^{c}
Recommended dose of fertilizers (RDF)	39.67^{bc}	60.06^{b}	84.73^{b}	87.33^{b}
Double dose of RDF	44.83^{a}	70.03^{a}	96.43^{a}	100.16^{a}
Half dose of RDF	36.20^{cd}	54.40^{bc}	82.23^{bc}	85.10^{b}
125% dose of RDF	40.67^{bc}	59.53^{b}	84.43^{b}	86.96^{b}
Azolla 300 kg/ ha	41.50^{ab}	55.46^{bc}	83.06^{bc}	85.60^{b}
FYM 6 ton/ ha	32.93^{d}	47.46^{d}	72.20^{d}	75.76^{c}
Critical value	4.460***	6.225***	8.987**	8.973***
SEm±	0.20	0.28	0.41	0.41
C.V%	6.53	6.14	6.13	5.91
Grand Mean	38.34	56.93	82.40	85.26

Description: CV: Coefficient of Variation; SEm±: Standard error of mean; *: Significant at 0.05 level of significance; **: Significant at 0.01 level of significance; ***: Significant at 0.001 level of significance; Values with same letters in a column are not significantly different at 5% level of significance by LSD test; DAT = days after transplanting.

(Table 4). The use of fertilizers has significantly increased the total number of tillers/hill at all growth stages over control. The highest number of tillers/hill was recorded on applying a double dose of RDF and the lowest was observed on control treatment on all days after transplanting and at harvest (Table 5). The interaction effect of NPK levels and bio-organics on the number of non-effective tillers/ hill was found non-significant at the time of harvest. Gupta *et al.* (2016) reported that balanced and optimum use of fertilizers increased the number of effective tillers. A similar result was obtained by Hasanuzzaman *et al.* (2010).

At harvest, the highest number of effective tillers/hill (6.76) was recorded on the application of 125% dose of RDF, and the least was recorded in the control treatment. This result is in alignment with the finding of Mahato *et al.* (2019) who recorded the highest number of effective tiller/ m^2 on the application of 120 kg N/ha.

No. of panicles per hill

The number of panicles/hill was significantly affected by different inorganic fertilizer and bio-organic treatments at both panicle initiation and harvest (Table 6). The study reveals that application of 125% dose of RDF (125: 37.5: 37.5 kg NPK/ ha) has produced a greater number of panicles (6.76) than any other treatments. The lowest number of panicles (4.30) was recorded in the control treatment. Among the bio-organics, application of FYM (6 ton/ ha) has produced a greater number of panicle (6.53) than application of *Azolla* (300 kg/ ha).

The application of various doses of RDF, FYM (6 ton/ ha), and *Azolla* (300 kg/ ha) has significantly increased the number of panicle half doses of RDF and control. This explains that N plays an important role in the formation of panicles. The number of panicles plays an important role in the production and has a direct effect on rice yield (DH *et al.*, 2014).

Table 4. Effect of different doses of fertilizers on the total number of tillers at different growth stages of rice.

Treatment	Total no of tillers per hill			
	25 DAT	50 DAT	75 DAT	At harvest
Control	7.10^{c}	8.10^{a}	8.30^{c}	8.43^{e}
Recommended dose of fertilizers (RDF)	7.33^{c}	8.36^{a}	8.53^{c}	9.16^{de}
Double dose of RDF	11.16^{a}	11.90^{a}	12.26^{a}	12.70^{a}
Half dose of RDF	8.36^{bc}	9.33^{a}	9.36^{bc}	9.86^{bcd}
125% dose of RDF	8.96^{bc}	9.76^{a}	10.10^{b}	10.80^{b}
Azolla 300 kg /ha	9.43^{ab}	9.90^{a}	10.13^{b}	10.50^{bc}
FYM 6 ton/ ha	7.93^{bc}	8.50^{a}	8.76^{bc}	9.56^{cd}
Critical value	1.818**	NS	1.396***	1.033***
SEm±	0.084	0.20	0.064	0.047
C.V%	11.78	26.64	8.14	5.72
Grand mean	8.67	9.40	9.63	10.14

Description: CV: Coefficient of Variation; SEm±: Standard error of mean; *: Significant at 0.05 level of significance; **: Significant at 0.01 level of significance; ***: Significant at 0.001 level of significance; Values with same letters in a column are not significantly different at 5% level of significance by LSD test; DAT = days after transplanting.

Table 5. Effect of different doses of fertilizers on effective and non-effective tillers per at different growth stages of rice.

Treatment	No. of non - effective tillers per hill		No. of effective tillers per hill	
	75 DAT	At Harvest	75 DAT	At Harvest
Control	5.80^{a}	1.60^{a}	1.48^{b}	4.30^{b}
Recommended dose of fertilizers (RDF)	4.40^{ab}	1.67^{a}	3.75^{a}	6.56^{a}
Double dose of RDF	2.13^{c}	1.56^{a}	5.64^{a}	6.13^{a}
Half dose of RDF	5.80^{a}	1.63^{a}	1.48^{b}	4.30^{b}
125% dose of RDF	2.40^{bc}	1.53^{a}	5.06^{a}	6.76^{a}
Azolla 300 kg /ha	2.46^{bc}	1.33^{a}	4.48^{a}	6.13^{a}
FYM 6 ton /ha	3.23^{bc}	1.67^{a}	5.30^{a}	6.53^{a}
Critical value	1.940**	NS	1.940**	1.603*
SEm±	0.089	0.038	0.09	0.074
C.V%	29.1	29.71	30.95	15.48
Grand Mean	3.74	1.57	3.88	5.81

Description: CV: Coefficient of Variation; SEm±: Standard error of mean; *: Significant at 0.05 level of significance; **: Significant at 0.01 level of significance; ***: Significant at 0.001 level of significance; Values with same letters in a column are not significantly different at 5% level of significance by LSD test; DAT = days after transplanting.

Table 6. Effect of different doses of fertilizers on number of panicles at different growth stages of rice.

Treatment	No. of panicles	
	75 DAT	At Harvest
Control	1.48[b]	4.30[b]
Recommended dose of fertilizers (RDF)	3.75[a]	6.57[a]
Double dose of RDF	5.64[a]	6.13[a]
Half dose of RDF	1.48[b]	4.30[b]
125% dose of RDF	5.06[a]	6.76[a]
Azolla 300 kg/ ha	4.48[a]	6.13[a]
FYM 6 ton/ ha	5.30[a]	6.53[a]
Critical value	2.140**	1.603*
SEm±	0.099	0.074
C.V%	30.95	15.48
Grand Mean	3.88	5.81

Description: CV: Coefficient of Variation; SEm±: Standard error of mean; *: Significant at 0.05 level of significance; **: Significant at 0.01 level of significance; ***: Significant at 0.001 level of significance; Values with same letters in a column are not significantly different at 5% level of significance by LSD test; DAT = days after transplanting.

Table 7. Effect of different doses of fertilizers on number of panicles at different growth stages of rice.

Treatment	Panicle length (cm)	
	75 DAT	At Harvest
Control	12.30[bc]	19.46[e]
Recommended dose of fertilizers (RDF)	22.96[a]	23.86[ab]
Double dose of RDF	23.83[a]	25.20[a]
Half dose of RDF	18.56[ab]	22.80[bcd]
125% dose of RDF	22.83[a]	23.67[abc]
Azolla 300 kg/ha	11.00[c]	21.26[d]
FYM 6 ton/ ha	19.90[a]	22.00[cd]
Critical value	6.760**	1.651***
SEm±	0.313	0.076
C.V%	20.24	4.10
Grand Mean	18.77	22.60

Description: CV: Coefficient of Variation; SEm±: Standard error of mean; *: Significant at 0.05 level of significance; **: Significant at 0.01 level of significance; ***: Significant at 0.001 level of significance; Values with same letters in a column are not significantly different at 5% level of significance by LSD test; DAT = days after transplanting.

Table 8. Effect of different doses of fertilizers on total spikelet per hill at different growth stages of rice.

Treatment	Total spikelet per hill	
	75 DAT	At Harvest
Control	165.36[c]	340.16[c]
Recommended dose of fertilizers (RDF)	814.36[ab]	854.93[a]
Double dose of RDF	981.93[a]	1003.13[a]
Half dose of RDF	571.26[b]	695.90[abc]
125% dose of RDF	856.56[ab]	930.60[a]
Azolla 300 kg/ ha	209.67[c]	389.50[bc]
FYM 6 ton/ ha	633.00[b]	715.86[ab]
Critical value	322.9***	347.3**
SEm±	14.975	16.10
C.V%	30.03	27.72
Grand Mean	604.59	704.3

Description: CV: Coefficient of Variation; SEm±: Standard error of mean; *: Significant at 0.05 level of significance; **: Significant at 0.01 level of significance; ***: Significant at 0.001 level of significance; Values with same letters in a column are not significantly different at 5% level of significance by LSD test; DAT = days after transplanting.

Panicle length

The effect of different treatments on the panicle length (cm) of rice is presented in Table 7. The panicle length has increased significantly with an increase in doses of NPK up to 75 DAT. Different doses of NPK fertilizer have gradually increased the panicle length after 75 DAT and at harvest. The highest panicle length (25.20cm) was observed in the plot applied with a double dose of RDF followed by the recommended dose of RDF (23.86cm), 125% dose of RDF (23.67 cm), the half dose of RDF (22.80cm), *Azolla* (21.26 cm) and FYM (22.00 cm) over control treatment. Hasanuzzaman *et al.* (2010) also reported the increase in panicle length with the application of NPK fertilizer. These might be due to the higher absorption of different fertilizers by the plant that favored to produce the longer panicle. Sah *et al.* (2019) during study reported that 180 kg N was found most effective for panicle length.

Table 9. Effect of different doses of fertilizers on 1000 grain weight at different growth stages of rice.

Treatment	1000 grain weight (gm)
	At Harvest
Control	18.90[f]
Recommended dose of fertilizers (RDF)	23.13[c]
Double dose of RDF	26.53[a]
Half dose of RDF	21.76[d]
125% dose of RDF	24.53[b]
Azolla 300 kg/ha	20.26[e]
FYM 6ton/ ha	22.26[d]
Critical value	0.805***
SEm±	0.037
C.V%	2.014
Grand Mean	22.48

Description: CV: Coefficient of Variation; SEm±: Standard error of mean; *: Significant at 0.05 level of significance; **: Significant at 0.01 level of significance; ***: Significant at 0.001 level of significance; Values with same letters in a column are not significantly different at 5% level of significance by LSD test; DAT = days after transplanting.

Table 10. Effect of different doses of fertilizers on grain and straw yield at different growth stages of rice.

Treatment	Yield potential per hectare (in tons)	
	Grain yield per hectare	Straw yield per hectare
Control	2.47[d]	12.32[c]
Recommended dose of fertilizers (RDF)	6.77[bc]	15.04[b]
Double dose of RDF	9.62[a]	16.80[a]
Half dose of RDF	5.09[c]	12.66[c]
125% dose of RDF	8.02[ab]	15.84[ab]
Azolla 300 kg/ ha	2.52[d]	12.23[c]
FYM 6ton/ha	5.04[c]	12.85[c]
Critical value	2.405***	1.355***
SEm±	0.111	0.062
C.V%	23.93	5.45
Grand mean	5.64	13.96

Description: CV: Coefficient of Variation; SEm±: Standard error of mean; *: Significant at 0.05 level of significance; **: Significant at 0.01 level of significance; ***: Significant at 0.001 level of significance; Values with same letters in a column are not significantly different at 5% level of significance by LSD test; DAT = days after transplanting.

Total spikelet per hill

The effects of different doses of fertilizers on total spikelet per hill at different growth stages of rice are presented in Table 8. Result of the study shows that the application of a double dose of RDF has significantly increased the number of spikelets per hill, producing the highest spikelet in both 75 DAT (981.93) and at harvest (1003.13). The lowest spikelet was produced by the control treatments in both 75DAT (165.36) and at harvest (340.16). Among the organic manures, FYM has produced a greater number of spikelet than *Azolla* but they both were lower than other doses of NPK treatments. Different studies and researches have proved that dressing of nitrogen is highly effective in maximizing spikelet production (Masni and Wasli, 2019).

1000 grain weight

The effect of different doses of fertilizers on 1000 grain weight at different growth stages of rice is presented in Table 9. The result of the experiment revealed that 1000 grain weight varied from 18.90 g (control) to 26.53 g (double dose of RDF). The 1000 grain weight of Chaite-5 variety has increased on increasing the dose of NPK. However, further increases in the NPK level did not bring significant variation in the 1000 grain weight of rice. This finding is in accordance with the findings of Mahato *et al.* (2019) who also reported that there is no influence on 1000 grain weight with different doses of nitrogen. Among bio-organics, the higher 1000 grain weight (22.26 g) was observed on application of FYM (6 ton/ ha), than the application of *Azolla* (300 kg /ha). However, the thousand-grain weight produced by the control treatment was significantly lower than that produced by other NPK and bio-organic treatments.

Grain yield and straw yield

The effect of different doses of fertilizers on grain and straw yield of rice at different stages of growth is presented in Table 10. The highest grain yield (9.62 ton/ ha) was recorded with the application of a double dose of RDF which was followed by a 125% dose of RDF (8.02 ton/ha), recommended dose of RDF (6.77 ton/ha). The least grain yield was recorded in the control treatment (2.47 ton/ha). Similarly, the highest straw yield was recorded on the application of a double dose of fertilizer (16.80 ton/ha) and the least straw yield (12.23 ton/ha) was recorded on the application of *Azolla*. A similar result was reported by the findings of Sah *et al.* (2019) who reported the highest straw yield was for N@180 kg/ha. Singh *et al.* (2014) also reported the incre-

ment in NPK level has significantly enhanced the grain yield over its lower level.

Post harvest soil analysis

The physio-chemical analysis of post-harvest soil was carried out after harvesting rice in the research field in the PIU Office, Dhanusha with the help of the soil kit method. The soil condition of the research field was sandy loam, with moderately acidic (pH: 5.8), high nitrogen content, high phosphorus content, and medium potash content. The improvement in soil status is in close agreement with earlier reports from Kurual and Tripathi (1990) who reported that soil fertility is not maintained from the NPK fertilizer application alone while application of FYM increased the crop yield and improved the soil quality. Also, studies showed that the soil pH in rice was lower than the initial value, which indicated that the acid deposition could have a great effect on the soil acidification in this trial region (Liu *et al*., 2009).

Conclusion

This study carried out on the effect of different fertilizer doses on the growth and yield of paddy revealed that the different rates of NPK fertilizer significantly improved the output of rice compared to the control. Among all the treatments, a double dose of fertilizers performed best in the growth and yield whereas 125% and recommended doses of fertilizers also performed satisfactorily. Therefore, a double dose of fertilizer can be the best supplement for improving growth and yield in rice. Application of fertilizers decreased the soil pH but the nitrogen and phosphorus content in soil was increased. However, there was no significant change in the potassium content of the soil.

ACKNOWLEDGMENT

We would like to acknowledge Prime Minister Agriculture Modernization Project (PMAMP), PIU Dhanusha for providing us Intern opportunity and handful of guidance and support. Also, we are thankful to our college administration and advisor for their continuous help and guidance.

Conflict of interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

REFERENCES

Dekhane, S. S., Patel, D. J., Jadhav, P. B., Kireeti, A., Patil, N. B., Harad, N. B., & Jadhav, K. P. (2014). Effect of organic and inorganic fertilizer on growth and yield of paddy cv gr 11. *International Journal of Information Research and Review*, *1*(2), 026-028.

DH, T. A., Azis, F. N., Hidayat, P., Susanti, D., Riyanto, A., & Zheng, S. H. (2014). Path Coefficient Analysis G39× ciherang And Mentik Wangi× g39 Rice In F4 Generation. *AGRIVITA, Journal of Agricultural Science*, *36*(1), 9-13.

FAO. (2013). FAOSTAT. Food and Agriculture Organization of the United Nations, Rome. Retrieved November 23, 2018 from http://www.fao.org/faostat/en/#data

Gupta, G., Shrestha, A., Shrestha, A., & Amgain, L. P. (2016). Evaluation of different nutrient management practice in yield and growth in rice in Morang district. *Advances in Plants and Agriculture Research*, *6*, 187-191.

Hasanuzzaman, M., Ahamed, K. U., Rahmatullah, M., Akhter, N., Nahar, K., & Rahman, M. L. (2010). Plant growth characters and productivity of wetland rice (*Oryza sativa* L.) as affected by application of different manures. *Emirates Journal of Food and Agriculture*, 46-58.

Jérémie, G. A. L. A. B. T. (2011). Rentabilité des engrais minéraux en riziculture pluviale de plateau dans le centre ouest de la Côte d'Ivoire.pdf. *Journal of Applied Biosciences*.

Kharel, L., Ghimire, S. K., Shrestha, J., Kunwar, C. B., & Sharma, S. (2018). Evaluation of rice genotypes for its response to added fertility levels and induced drought tolerance during reproductive phase: Rice genotypes responses to added fertility levels and drought. *Journal of AgriSearch*, *5*(1), 13-18.

Kurual, A., & Tripathi, R. P. (1990). Effect of continuous use of manures and fertilizers on physical properties of soil under paddy-wheat-cowpea cropping system. *Crop Research*, *3*(1), 7-12.

Liu, M., Hu, F., Chen, X., Huang, Q., Jiao, J., Zhang, B., & Li, H. (2009). Organic amendments with reduced chemical fertilizer promote soil microbial development and nutrient availability in a subtropical paddy field: The influence of quantity, type and application time of organic amendments. *Applied Soil Ecology*, *42*(2), 166–175. https://doi.org/10.1016/j.apsoil.2009.03.006

Mahato, M., Gautam, B., Kunwar, R., & Joshi, D. (2019). Effect of Different Date of Sowing and Nitrogen Level on Production of Direct Seeded Rice. *American Journal of Food Science and Nutrition*. , *6*(1), 1–5

Masni, Z., & Wasli, M. E. (2019). Yield performance and nutrient uptake of red rice variety (MRM 16) at different NPK fertilizer rates. *International Journal of Agronomy*, *2019*.

Meena, R. K., Neupane, M. P., & Singh, S. P. (2015). Effect of phosphorus levels and bio-organic sources on growth and yield of rice (*Oryza sativa* L.). *International Journal of Agricultural Sciences*, *11*(2), 286–289. https://doi.org/10.15740/HAS/IJAS/11.2/286-289

Moro, B. M., Nuhu, I. R., Ato, E., & Nathanial, B. (2015). Effect of nitrogen rates on the growth and yield of three rice (Oryza sativa L.) varieties in rain-fed lowland in the forest agro-ecological zone of Ghana. *International Journal of Agricultural Sciences*, *5*(7), 878-885.

Oladele, S., & Awodun, M. (2014). Response of lowland rice to biofertilizesr inoculation and their effects on growth and yield in Southwestern Nigeria. *Journal of Agriculture and Environmental Science*, *3*(2), 371-390.

Sah, M. K., Shah, P., Yadav, R., Sah, J. N., & Ranjan, R. (2019). Interaction of nitrogen doses and establishment methods in lowland rice at Parwanipur, Bara, Nepal. *Archives of Agriculture and Environmental Science*, *4*(1), 113–118, https://doi.org/10.26832/24566632.2019.0401018

Singh, S., Singh, S. P., Neupane, M. P., & Meena, R. K. (2014). Effect of NPK levels, BGA and FYM on growth and yield of rice (*Oryza sativa* L.). *Environmental Ecology*, *32*(1A), 301-303.

Sultana, S., Hashem, M. A., Haque, T. S., Baki, M. Z., & Haque, M. M. (2015). Optimization of Nitrogen Dose for Yield Maximization of BRRIdhan49. *American Journal of Biology and Life Sciences*, *3*(3), 58-64.

Yousaf, M., Li, X., Zhang, Z., Ren, T., Cong, R., Ata-Ul-Karim, S. T., Fahad, S., Shah, A. N., & Lu, J. (2016). Nitrogen fertilizer management for enhancing crop productivity and nitrogen use efficiency in a rice-oilseed rape rotation system in china. *Frontiers in Plant Science*, *7*.