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RESEARCH PAPER

Integrated Nutrient Management for Chilli in the Southern Region of Bangladesh

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ABSTRACT

A field experiment was conducted at Regional Agricultural Research Station, Rahmatpur, Barishal during November 2016 to June 2017 to develop nutrient management practice for chilli in the southern region of Bangladesh. The crop variety was BARI Marich 2. Poultry manure was used with chemical fertilizers. There were five treatments viz. T_1: Soil test base (STB) fertilizer dose for HYV, T_2: STB + 5t/ha poultry manure, T_3: 50% STB + 5t/ha poultry manure, T_4: FRG'2012 for HYV (100-60-100-20-2-1 kg N-P-K-S-Zn-B ha^{-1}) and T_5: Absolute control which were replicated for four times. Poultry manure along with chemical fertilizers had significant influence on plant height (cm), root length, shoot and root dry weight, no of fruits $plant^{-1}$, fruit yield $plant^{-1}$, fruit yield $plot^{-1}$ and fruit yield ha^{-1} (t) of chilli. Significantly the highest fruit yield (40.98 t ha^{-1}) along with root (3.06 g) and shoot (13.54) dry weight, no of fruits $plant^{-1}$ (27.10), yield $plant^{-1}$ (23.52 g) was recorded with STB + 5t/ha poultry manure which was statistically similar with the results obtained from 50% STB + 5t/ha poultry manure. Therefore, 50% STB could be reduced when integrated use of poultry manure with chemical fertilizers in chilli cultivation in southern region, Barishal (Non–calcareous Grey Floodplain Soils under AEZ 13).

Key words: Chilli, integrated, management, nutrient

Introduction

Chilli (*Capsicum frutescens* L.) belong to the nightshade family, Solanaceae. It was originated from South America. The name comes from Nahuat via the Spanish word chilli (Wikipedia, 2006), is an important spice crop grown all over Bangladesh. It is very rich in vitamin C and pro-vitamin A, particularly the red chilies. Yellow and especially green chillies (which are essentially unripe fruit) contain a considerably lower amount of both substances. In addition, peppers are a good source of most B vitamins, and vitamin B6in particular (Sparkyby, 2006). The yield of chillies obtained in Bangladesh is far less than the potential exists. The causes of low yield may be due to improper cultural operations, inputs etc. Chilli occupies nearly 2.51lac acres with annual production 1.30 lac. MT (Yearbook of Agricultural Statistics, 2017)). The average yield of chilli is 0.08 t ha^1 (Anonymous, 2007) which is comparatively low in respect to other countries. Of the inputs, N. P. K. fertilizers play a significant role in successful chilli production (Jack *et al.*, 2006). The reasons for this low yield are multifarious. The most important reasons are inadequate and irrational use of fertilizers by the farmers and the depletion of native soil fertility and soil productivity due to intensive cropping. The yield of chilli is greatly influenced by organic and inorganic fertilizers. Improved soil fertility is a pre-requisite for increasing crop productivity. The practice of chemical fertilizer with Poultry Manure is important for sustainability of soil fertility of Bangladesh. Organic manure not only supply nutrients into the soil but also enriches the physical properties of soil. On the other hand, chemical fertilizers only supply nutrients into the soil. There are several factors, which are responsible for low yield i.e. unavailability of approved varieties, lack of modern technology and technical guidance. Among the various factors affecting the yield, the most important one is to supply an adequate amount of organic and chemical fertilizers. The proper combination of organic

and chemical fertilizers enhances the growth and development of the crop. The objectives of the experiment were (i) to find out efficacy of poultry manure with chemical fertilizer on Chilli production and (ii) to find out the yield performance of chilli after manuring.

Materials and Methods

A field experiment was carried out from November 2016 to June 2017 for chilli at Regional Agricultural Research Station (RARS), Rahmatpur, Barishal. The experiment was laid out in Randomized Complete Block Design (RCBD) with four replications. There were five treatment combinations viz T_1: Soil test base (STB) fertilizer dose for HYV, T_2: STB + 5t/ha poultry manure, T_3: 50% STB + 5t/ha poultry manure, T_4: FRG'2012 for HYV (100-60-100-20-2-1 kg N-P-K-S-Zn-B ha^{-1}) and T_5: Absolute control. The tested crop was tomato (cv. BARI Marich-2). The unit plots measured 2.4 m × 2.4 m in size. Seeds were sown in seed bed and transplanted after 30 days in field. The physical and chemical properties of the initial soil samples from experimental fields at a depth of 0-15 cm were collected and analyzed following standard methods and presented in Table 1.

Nitrogen, phosphorus, potassium, sulphur, zinc and boron were used in the form of urea, TSP, MoP, gypsum, zinc sulphate and boric acid, respectively. Recommended fertilizer dose (BARC, 2012) for chilli (160 kg N, 90 kg P, 60 kg K, 30 kg S, 1.5 kg Zn and 0.5 kg B kg ha^{-1}) were used. All P, K, S, Zn, B and $^1/_3{}^{rd}$ amount urea were applied at the time of final land preparation and the remaining $^2/_3{}^{rd}$ amount of urea-N were applied in two equal installments at 25 and 45 days of transplanting. All the intercultural operations such as irrigation, sticking, weeding, insect control etc. were done as and when necessary. Data on yield and yield components were recorded at maturity. The initial soil samples at a depth of 0-15 cm from the experimental fields were collected and analyzed following standard methods (Table 1).

Statistical analyses were conducted using standard statistical procedures (Gomez and Gomez, 1984) implemented in Statistix 10. The data were examined by analysis of variance (ANOVA). Differences between the treatment mean were determined by ANOVA, and Fisher's protected least significant difference (LSD) was calculated at the 5% probability level for treatment mean comparisons.

Table 1. Initial fertility status of the soil samples of RARS, Rahmatpur, Barishal

Soil Properties	Texture	pH	EC (dsm^{-1})	OM (%)	Total N (%)	K	P	S	B
						meq $100g^{-1}$	µg g^{-1}		
Experiment field	Sandy clay loam	7.4	0.72	0.30	0.07	0.22	15	12	0.18
Interpretation	-	-		-	Very low	Medium	Medium	Low	Low

Results and Discussion

Effect of integrated nutrient management on vegetative characters

Among the vegetative characters of chilli root length and shoot dry weight differed significantly due to different treatments as studied under this experiment (Table 2). However, no significant effect was observed in plant height and root dry weight. Plant height was found the highest (29.60) in 50% STB + 5 t/ha poultry manure (T_3) followed by absolute control and lowest (27.05 cm) in FRG'2012 for HYV (T_4). Root length, root and shoot dry weight became the highest in STB + 5 t/ha poultry manure (T_2) which was recorded 11.20 cm, 3.06 g and 13.54 g, respectively followed by 50% STB + 5 t/ha poultry manure (T_3). Root length, root and shoot dry weight became the lowest in soil test base fertilizer dose for HYV followed by FRG'2012 for HYV (T_4).These results are in conformity with the findings of Chouhan *et al*. (2017), Chumyani *et al*. (2012) in tomato, Vimera *et al*. (2012) in king chilli and Chumei *et al.* (2013) in brinjal, who found maximum growth characters under integrated nutrient supply systems. Similar results have been reported by Sharma *et al*. (2000) using compound liquid fertilizer containing most macro and micro nutrients "Poly feed and Multi" along with NPK and mentioned that these fertilizers provide nutrients to the plant by foliar application and significant effect on vegetative growth per plant.

Effect of integrated nutrient application on yield and yield contributing characters

Significant variations were observed in number of fruits/plant, yield/plant, yield/plot and yield/ha due to nutrient management on chilli (Table 3). Number of fruits became the highest in FRG'2012 for HYV (T_4) (27.05) followed by STB + 5 t/ha poultry manure (T_2) (27.10) the lowest was recorded in STB for HYV (T_1) (20.70). Again, yield/plant, yield/plot and yield/ha became the highest in STB + 5 t/ha poultry manure (T_2) and it was recorded 23.52 g, 0.49 kg and 40.98 ton, respectively which was statistically similar with 50% STB + 5 t/ha poultry manure (T_3) and absolute control. And the minimum yield was found in control (T_1).Similar results were also reported by Subbaiah *et al*. (1982) in Chilli.

In the present study increase in growth and morphological parameters in the early stages of crop growth, indicate the efficiency of the plant to trap the available solar radiation efficiently which resulted in the increased rates of assimilates which in turn used in the fruit formation, thus ultimately increased the yield per unit area. The results of the present investigation are in conformity with the findings of Swamy and Subba Rao (1992). Range of the yield recorded here was similar with the results obtained by Mujumdar *et al*. (2000),

Table 2. Effect of fertilizer doses on different vegetative characters of chilli in the southern region of Bangladesh during 2016-2017

Treatment	Plant height (cm)	Root length (cm)	Root dry weight (g)/plant	Shoot dry weight (g)/plant
T_1 : Soil test base (STB) fertilizer dosefor HYG	27.30	7.55	2.04	8.01
T_2 : STB + 5 t poultry manure (PM)/ha	28.75	11.20	3.06	13.54
T_3 : 50% STB + 5 t PM/ha	29.60	10.85	2.70	11.23
T_4 : FRG'2012 for HYG	27.05	8.45	2.12	8.12
T_5 : Absolute control.	29.55	8.90	2.75	8.35
CV %	9.86%	11.26%	22.46%	13.27%
LSD 0.05	4.32	1.63	0.88	1.42
Level of significance	NS	**	NS	**

Table 3. Effect of fertilizer doses on different yield and yield contributing characters of chilli in the southern region of Bangladesh

Treatment	No. of fruit/plant	Yield/plant (g)	Yield/plot (kg)	Yield (t/ha)
T_1: Soil test base (STB) fertilizer dose for HYG	20.70	15.55	0.34	28.59
T_2 : STB + 5 t poultry manure (PM)/ha	27.10	23.52	0.49	40.98
T_3 : 50% STB + 5 t PM/ha	22.80	19.70	0.46	38.11
T_4 : FRG'2012 for HYG	27.15	18.13	0.41	29.11
T_5: Absolute control	20.90	14.74	0.38	32.15
CV %	14.74%	18.13%	13.92%	12.75%
LSD 0.05	5.39	5.12	0.09	6.64
Level of significance	*	*	*	**

Kasture (2001) and Kokare (2013). Chopra *et al*. (2005) also found the superior yield of chilli genotypes with organic and inorganic nutrient combination.

Conclusion

Considering all the experimental observations it can be concluded that STB + 5 t/ha poultry manure gave superior results than others. Again, 50% STB + 5 t/ha poultry manure also found to have statistically similar results with STB + 5 t/ha poultry manure. This is first year experiment. It should be continued the next year.

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