

Effectiveness Of Chicken Manure And Lime On Growth And Productivity Of Hot Chilli

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Abstract

Results of this study could be concluded that co-application of lime, chicken manure and NPK, which brought the high yield of hot chilli is one of the commercial high value crops in An Giang. It is called as the universal spice of Vietnam, since it is cultivated in almost all the districts. It is commercially important for the two qualities, the red colour due to the pigment capsanthin and the biting taste due to the chemical constituent capsaicin. Chilli crop requires a balanced fertilizer management without which growth and development of the crop will be impaired leading to substantial reduction not only in yield but also in the market appeal of the produce namely the colour and quality of the dry chilli. Hence, the present study was carried out to find out effects of chicken manure, lime and NPK along with various treatments on the growth, yield and quality improvement of chilli. This study was found that growth and yield of chilli were significantly influenced by different treatment combinations. Among the treatments, application of 0.5 tons CaCO_3 per ha associated with 2.0 t chicken manure per ha + NPK, which had the highest growth characters such as the plant height, number of tillers and leaves per plant. On the other hand, yield of chilli fresh that was 14, 8 tons per ha had the highest value comparison with other treatments and inorganic fertilizers along with 0.5 tons CaCO_3 per ha could increase the growth and yield of hot chilli.

Keywords: Chilli, chicken manure, NPK, lime, growth, yield.

1. Introduction

The hot chilli (*Capsicum frutescens* L.), which has recently planted in An Giang cultivated in a large area of 1.500 hectares with the total production of 7, 46 t ha^{-1} [1]. The red colour is due to the pigment capsanthin and the biting taste of the chemical constituent capsaicin. However, farmers are limited among the factors by lack of technology and the limited cultivation in the local country currently [2]. Application of four rates (0, 20, 40, 60 t ha^{-1}) of organic fertilizer (processed poultry manure) and three rates of inorganic fertilizer (0, 2 and 3 t ha^{-1}) were evaluated on bird chilli grown on an upland clay soil [3]. Capsaicin is a digestive stimulant, which prevents heart diseases and is curative for many rheumatic troubles [4]. Besides, chilli is very useful in our daily diet since it is a rich source of vitamins A and C, polyphenols, chlorophylls, carotenoids, sugars, magnesium,

calcium, potassium, phosphorus and iron [5, 6]. Application of organic fertilizers can improve soil physical and biological environment but suffers from drawback of low content of plant nutrient. On the other hand, application of chemical fertilizers alone can supply only one or two nutrient elements to the crop [7]. Among the various factors affecting the growth and productivity of chilli, the fertility of the soil is the prime consideration for increasing the crop production. Improvement in growth and yield can be brought about by the application of different doses of essential nutrients [8]. The beneficial effect of organic manure associated with elevated temperatures was found to have high efficiency in improving chilli peppers' nutrient content and crop productivity [9]. Application of Lime, cow manure combined NPK had significant improve the soil pH, OM, total available N, P K in chilli soil and higher than that of the control [10]. The co-application of lime, cow manure and NPK

increased the yield of chilli and the soil available characters were improved for all treatments [11].

2. Materials and methods

The field study is carried out in Chau Thanh district, An Giang province. Five treatment of the experiment was included: C1: applied belong to famers (NPK:90-60-60 kg per ha); C2 [0.5 t $\text{CaCO}_3 \text{ ha}^{-1}$ + 2 tons chicken manure (CM)/ ha]; C3 (2.0 t CM ha^{-1}); C4 (NPK+ 2.0 t CM ha^{-1}) and C5 (0.5 t $\text{CaCO}_3 \text{ ha}^{-1}$ + 2.0 t CM ha^{-1} + NPK) with 4 replications. The kind of irrigation water (river water), with area of each replicate of being equivalent to 15 m² (5 m x 3 m), planted in a single row with distance of 50 cm x 30 cm (three seeds per hole), the distance between plants is 30 cm and is 50 cm in each row.

Each pot was fertilized with a basal dose of N, P and K at 90:60:60 kg ha^{-1} , respectively [12]. The chemical fertilizers were used by urea, muriate of potash and single super phosphate. The lime, P and CM were applied before planting except N and K which were applied in two split doses. Fifty percent of nitrogen was applied as a basal dose before planting and the rest was top dressed 60 days after planting. Observations on growth characters (recorded at 20, 45, 65 days and harvest) like plant height, number of tillers and leaves/ plant were recorded and the data were statistically analysed. Besides, observations on per plant, per plot and per hectare yield of fresh fruits were recorded and statistically analysed.

3. Results and discussion

The results pH in soil (Table 1) showed is quite suitable for growing of hot chilli (pH = 60.6) [13]. The total nitrogen is average level (0,188%) [14]. The available Phosphor was not quite low level (31,1 mg/100g) [14]. Specially, there were low exchangeable K (0.150 meq/100g) and poor organic matter content (2.28 %) [15].

Table 1. Soil particle size distribution and chemical characteristics at the first of the experiment

No.	Characters	Results
1	pH _{H2O}	6.06
2	Total N (%)	0.108
3	Available P (mg/100g)	31.1
4	Exchangeable K (meq/100g)	0.150
5	OM (%)	2.28

The results in Table 2 showed that amendment treatments had significantly affected on the soil pH, N,P,K, OM and C/N at harvest. On the other

hand, the highest total nitrogen percent was obtained at the C5 treatment, while the highest soil available phosphorous, Available K and organic matter content were obtained by the C2 treatment. The lowest C/N ratio (5.84) was obtained from the C5 treatment, while the C3 treatment had the highest C/N ratio (6.99) compared to the other treatments.

Table 2. Soil chemical analysis at the end of the experiment

Treatments	pH	Total N (%)	Available P (mg/100g)	Available K (meq/100g)	Total OM (%)	C/N
C1:90kg N-60kg P-60kg K kg/ ha (Control)	5.90 ^a	0.116 ^c	60.7 ^c	0.14 ^b	1.31 ^d	6.64 ^b
C2: 0.5 t $\text{CaCO}_3 \text{ ha}^{-1}$ + 2 t CM per ha	6.61 ^b	0.142 ^b	97.3 ^a	0.17 ^a	1.63 ^a	6.58 ^b
C3: 2.0 t CM per ha	6.20 ^c	0.113 ^c	32.5 ^d	0.12 ^d	1.38 ^c	6.99 ^a
C4: NPK+ 2.0 t CM per ha	6.32 ^c	0.146 ^b	92.7 ^b	0.13 ^c	1.67 ^a	6.58 ^b
C5: 0.5 t $\text{CaCO}_3 \text{ ha}^{-1}$ + 2.0 t CM/ha+NPK	6.91 ^a	0.153 ^a	92.1 ^b	0.14 ^b	1.53 ^b	5.84 ^c
F	**	**	**	**	**	**
CV (%)	11.4	11.8	12.8	3.09	12.1	11.2

(**): it is significantly different according to LSD at 1% level.

Table 3. Effect of CM and lime on plant height of hot chilli

Treatments	Plant height (cm)			
	20 days	45 days	65 days	harvest
C1 (Control)	15.1 ^c	35.0 ^{ab}	46.0 ^b	58.2 ^b
C2	14.7 ^c	31.1 ^c	32.7 ^c	41.7 ^c
C3	11.8 ^d	22.6 ^d	29.6 ^c	37.0 ^d
C4	17.7 ^b	34.5 ^b	47.5 ^b	59.8 ^b
C5	19.4 ^a	37.5 ^a	63.0 ^a	70.6 ^a
F	*	*	*	*
CV (%)	6.57	5.65	9.44	4.58

Values are the mean of four replicates. Means within each column having different letters, are significantly different according to LSD at 5 % () level.

The result of Table 3 showed that lime, CM and NPK affected to the hight of hot chilli. The height of chillt plants raised by combined the rates of lime and CM. In the treatment C5, the highest hight of hot chilli is 19.4 cm, 37.5 cm, 63.0 cm and 70.6 cm in 20 days, 45 days, 65 days and harvest, respectively. On the contrary, lime combined CM in C3 (Without NPK), chilli plant had the lowest hight about 11.8 cm, 22.6 cm, 29.6 cm and 37.0 cm in 20 days, 45 days, 65 days and harvest, respectively. Number of leaves and tillers of chilli significantly influenced with all types of chicken manure, lime and NPK as presented in Table 3 & 4. The growth of chilli plant had the maximum plant height, number of tillers/ plant, number of leaves/plant in treatment C5 compared to other treatments (Table 3, 4 & 5). The plants in C3 (2.0

t CM per ha only) had the shortest plant height and the number of tillers, leaves of chilli were the lowest during the growth time compared to others (Table 3, 4 & 5).

Similarly, results were obtained in prior studies of Vimala et al., (2007) [16], although the chilli growth and yield of C5 treatment (NPK combined chicken manure and lime) were clearly identical to that of other organic manure treatments and it was statistically different from another treatment C2 combining chicken manure and lime except plant height and number of tillers and leaves/plant. However, leaf number and plant height only increased slightly with the only cow manure application than those with others (Table 3, 4 and 5). The better performance of plants was probably because it acted as natural fertilizer with pesticidal properties which protects plant roots from nematodes, soil grubs and white ants and performs as a nitrification inhibitor and prolongs the availability of nitrogen to short duration as well as long duration crops. Beside these, it improves the soil condition considerably and protects the soil during the droughts. The chicken manure provided nutrients to the plants and may improve edaphic factors, which resulted in higher chilli growth parameters if combining with NPK and lime (Table 3, 4 and 5). These results are in good agreement with the findings of several researchers which revealed that the root, shoot, and fruit dry weights of chilli pepper of the co-application treatments of organic manure and inorganic increased by 21.4%, 52.4%, and 79.7%, respectively, compared to the control treatment in the greenhouse. The best solution for chilli pepper production under variable climate conditions might be the rational use co-application of organic, lime and inorganic [17, 18, 19, 20].

Table 4. Number of Chilli leaves as influenced by NPK, CM and lime

Treatments	No. of leaves of Chilli			
	20 days	45 days	65 days	harvest
C1 (Control)	15.4 ^b	49.1 ^c	169 ^b	207 ^b
C2	15.0 ^b	33.0 ^d	123 ^c	163 ^c
C3	13.2 ^c	22.8 ^e	101 ^c	104 ^d
C4	19.8 ^a	53.9 ^b	180 ^b	263 ^a
C5	21.1 ^a	58.4 ^a	254 ^a	286 ^a
F	*	*	*	*
CV (%)	6.42	4.88	11.5	8.28

* Values are the mean of four replicates. Means within each column having different letters, are significantly different according to LSD at 5 % (*) level.

The treatment consisting of NPK along with CM (2 tons/ha) and liming (0,5 ton/ ha) (C5) exhibited the highest yield of fresh (10, 5 t ha⁻¹). Balanced

nutrition of organic and inorganic nutrients maintains optimum ratio between the nutrients, which is of considerable importance in improving the yield. The analysis of variance for yield is shown in Table 6. The significant effects were obtained for all the CM, lime and chemical fertilizer (NPK) application. Interaction effects were significant and yields (Fig.1). Yield raised significantly from 3.02 t ha⁻¹ at C3 to a maximum of 14.8 t ha⁻¹ at C5. All growth parameters were improved when hot chilli plants received advantage effects of lime and CM. Moreover, the greatest potential of chilli growth was resulted by co-application of lime with CM. Continued application of other levels of lime and organic enhanced yield and reduced the need to chemical fertilizer, pesticide ultimate, conserved environment and braving sustainability. These results are in similarity with the discovery of several researchers which revealed that increasing yield of yield from the co-application treatments of lime, organic manure and inorganic fertilizer. Further, The results of Sanjutha et al. (2008) [21], presented that the highest number of fruit per plant when the high content of organic and inorganic fertilizers were applied.

Table 5. Number of Chilli Tillers as influenced by NPK, CM and lime

Treatments	No. of tillers / plant			
	20 days	45 days	65 days	harvest
C1 (Control)	1.30 ^c	14.0 ^c	26.1 ^b	31.8 ^c
C2	1.20 ^{cd}	12.0 ^d	16.0 ^c	20.2 ^d
C3	1.00 ^d	7.70 ^e	12.2 ^c	15.0 ^e
C4	1.60 ^b	18.0 ^b	30.0 ^b	40.3 ^b
C5	2.00 ^a	25.5 ^a	36.2 ^a	46.0 ^a
F	*	*	*	*
CV (%)	9.25	7.77	13.5	6.93

* Values are the mean of four replicates. Means within each column having different letters, are significantly different according to LSD at 5 % (*) level.

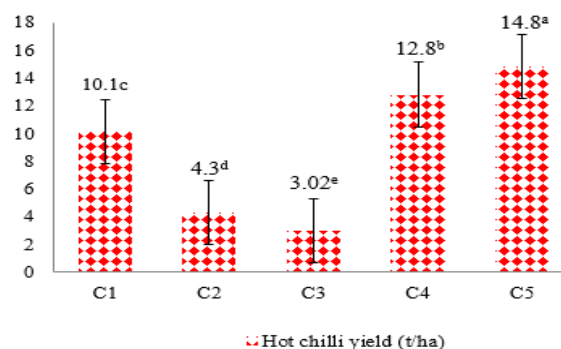


Fig.1 Hot chilli yield

4. Conclusion

The co-application of organic, inorganic and lime had significantly affected on the soil pH, NPK, OM and C/N ratio. The treatment differences for the various growth, yield of hot chilli were significant. Among the different treatments tried, application of 2 tons CM, 0.5 tons CaCO₃ combined NPK at 90:60:60 per ha was superior and hence, it may be concluded that co-application of organic, inorganic and lime can help to increase the growth and yield of chilli.

5. References

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