

Extended Abstract

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Effect of Integrated Nutrient Management on Green Pod Yield of Chilli

(*Capsicum annuum* L.) cv MIPC-01

1. Abstract

A field experiment was conducted to study the effect of combined application of organic manures with recommended inorganic fertilizers (RIF) and to find out the best combination of applications on green pod yield of chilli cv. MIPC-01. The following five treatment combinations viz. T₁- No fertilizer (control plot), T₂- 100% IF, T₃- 50%

IF + cattle manure (15 t ha⁻¹), T₄- 50% RIF + cattle manure (15 t ha⁻¹) + partially burnt

paddy husk (250 kg ha⁻¹), T₅- 50% RIF + cattle manure (15 t ha⁻¹) + partially burnt paddy husk (500 kg ha⁻¹) were laid out in a Randomised Completely Block Design and replicated four times. The measurements related to growth and yield parameters such as plant height, number of flowers, pods per plant and average pod length were taken using Destructive random sampling method. The results revealed that the maximum average plant height of 22.85 cm, 53.58 cm and 67.73 cm were observed in T₅- 50% RIF with 15 t ha⁻¹ cattle manure and 500 kg ha⁻¹ partially burnt paddy husk added plots at 30, 90 and 120 days after transplanting (DAT), respectively. Among the tested fertilizer combinations there were significant differences (p<0.05) observed in plant height, root length, number of flowers, average pod weight compared to the control treatment. In the vegetative stage, the highest average plant height of 22.85 cm was observed in T₅- 50% RIF + cattle manure (15 t ha⁻¹) + partially burnt paddy husk (500 kg ha⁻¹) and the lowest average plant height of 12.58 cm was observed in control plot. The average root length of 15.8 cm was observed in T₄ (50% RIF + cattle manure (15 t ha⁻¹) + partially burnt paddy husk (250 kg ha⁻¹) at 120 DAT. The application of 50% RIF, 15 t ha⁻¹ cattle manure along with (500 kg ha⁻¹) partially burnt paddy husk produced higher number of flowers (7.50 and 12.75) at 85 days and 120 DAT, respectively. Similarly, higher average number of pods per plant (10.5 and 24.5) and average pod length (4.50 cm and 4.73 cm) were also recorded in T₅, which had 50% RIF, 15 t ha⁻¹ cattle manure along with 500 kg ha⁻¹ partially burnt paddy husk over the control treatment. It is concluded that application of 50% RIF with 15 t ha⁻¹ cattle manure and 500 kg ha⁻¹ partially burnt paddy husk is the best combination to obtain higher green pod yield of chilli.

2. Introduction and research problem/issue

During the past few decades, intensive agriculture involving exhaustive high yielding varieties has led to heavy removal of nutrients from the soil. Generally, excessive amounts of inorganic fertilizers are applied to vegetables in order to achieve a higher yield and maximum value of growth. Continuous cultivation of soil coupled with the usage of inorganic fertilizers, has been implicated in soil acidification, reduction of soil organic carbon and organic matter, nutrient imbalance, deficiency of secondary macronutrients and micronutrients (Osundare, 2004). Therefore, the use of organic fertilizer is favorable to the soil in terms of alleviating soil acidity, enhancement of soil

physical properties and nutrient status (Aro and Agwu, 2005). Conversely, the use of manures only cannot fulfill the crop nutrients requirement. Therefore, in the nutrient management, the organic manures are mixed with inorganic fertilizers to get better yield (Bokhtiar, 2008).

Chilli (*Capsicum annum* L.) is one of the important cash and crop extensively grown in Sri Lanka for dry chilli production, but part is harvested as green pods. The average extent under green chilli was 8,218 ha and the annual production of chilli in Sri Lanka was 50,717 Mt in 2015/2016 Maha season (Department of Census and Statistics, 2016). Currently in Sri Lanka, Chilli production is generally depending on the inorganic fertilizer, but due to the difficulties associated with any inorganic fertilizer, Chilli production using organic fertilizer is also timely needed (Dahanayake *et al.*, 2012). Use of organic manures alone cannot fulfil the crop nutrients requirement. There is an appropriate proportion between the available and chemical sources and it should be integrated to develop the best combination of the inputs for accomplishing quantity and quality in chilli (Rani *et al.*, 2015).

It is therefore necessary to source for locally available, cheap and environmental materials that can be used with integration for chilli production. Cattle manure is used organic manure for crop cultivation and it comprises macronutrients chiefly Nitrogen (N) 20.7%, Potassium (K) 0.15% and Phosphorus (P) 0.42% (Omogoye, 2015) with other micronutrients that can be utilized by the chilli to overcome nutrition deficiencies. Partially burnt paddy husk has the ameliorative properties due to high content of potassium with silicon, and additional nutrients which have great potential for amending soil, while those with relatively higher carbon content (Milla *et al.*, 2013). Hence, an investigation was undertaken to study the effect of combined applications of cattle manure and partially burnt paddy husk with inorganic fertilizers on growth and green pod yield of chilli.

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3. Research Methodology

Location and experimental details

The experiment was carried out at In-Service Training Institute, Karadiyanaru, Sri Lanka, in the *maha* season 2015 - 2016. The soil type of this site is Reddish Brown Earth. The chilli (*Capsicum annum L.*) cv. MIPC was used in this experiment. The plot size was 180 x 180 cm. This experiment was carried out using a Randomized Completely Block Design and replicated four times. The treatment combinations are given below.

T₁- No fertilizer (control plot)

T₂- 100% inorganic fertilizers (As recommended by the Department of Agriculture, Sri Lanka)

T₃- 50% inorganic fertilizers + cattle manure (15 t ha⁻¹)

T₄- 50% inorganic fertilizers + cattle manure (15 t ha⁻¹) + partially burnt paddy husk (250 kg ha⁻¹)

T₅- 50% inorganic fertilizers + cattle manure (15 t ha⁻¹) + partially burnt paddy husk (500 kg ha⁻¹)

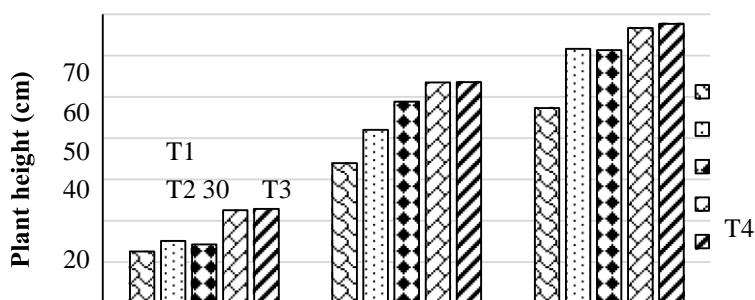
Agronomic practices, Sampling and Statistical analysis

All the agronomic practices except to fertilizer applications were done as recommended by the Department of Agriculture, Sri Lanka. Growth and yield measurements of plant height, number of flowers, pods per plant and average pod length were taken using Destructive random sampling method. Data were analyzed using SAS 9.1 portable version and the treatment means were compared by using DMRT at 1 and 5% significant levels.

4. Results and findings

Plant Height

It was observed that the combined application of organic and inorganic fertilizers had a significant influence on the vegetative growth of the crop. The results revealed that the lowest plant height of 12.58 cm and highest height of 67.73 cm were observed in T₁- No fertilizer (Control plot) and Treatment T₅- 50% IF + cattle manure (15 t ha⁻¹) + partially burnt paddy husk (500 kg ha⁻¹) at 30 and 90 DAT respectively as shown in Figure 1. These results indicated that the mixing cattle manure and partially burnt paddy husk had significantly ($p < 0.05$) increased the plant height during growth period. The increased plant height might be due to elongation of cells and increasing number of cells due to higher rate of cell division under nitrogen being a non-limited factor. The results were in conformity with the findings of (Jose *et al.*, 1988) in the integrated use of urea and poultry manure resulted in a higher nutrient uptake and plant growth.



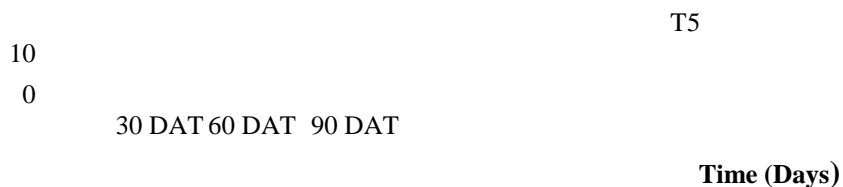


Figure 1: Effect of inorganic and organic manures (plant height of chilli and 90 days after planting (DAT)).

T₁- No fertilizer (Control plot), T₂- 100% Inorganic fertilizers, T₃- 50% Inorganic cattle manure (15 t ha⁻¹), T₄- 50% Inorganic fertilizers + cattle manure (15 t ha⁻¹) + burnt paddy husk (250 kg ha⁻¹), T₅- 50% Inorganic fertilizers + cattle manure (15 t ha⁻¹) + burnt paddy husk (500 kg ha⁻¹)

Average number of flowers

The number of flowers produced per chilli plants were increased at different growth transplanting. From the data, it appeared that there was a significant difference number of flowers 120 DAT as shown in Table 1.

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Table 1: Number of flowers produced per chilli plants grown under different fertilizer combinations at 85 and 120 days after transplanting (DAT)

Treatments	Number of flowers at 85 days	Number of flowers at 120 days
T1	1.75c	5.50b
T2	3.75bc	6.50b
T3	7.25a	8.75ab
T4	5.25ab	10.25ab
T5	7.50a	12.75a
F test	P < 0.01	P < 0.05

The data represents means of four replicates.

Mean values in a same column having the similar letter/letters indicate not significant differences at 5% level of significance by DMRT.

The minimum number of flowers (5.50) per plant was produced by treatment T₁. While the maximum number of flowers (12.75) per plant was noted with T₅. In both growth periods, the lowest value was obtained in the treatment T₁ (control plot). The finding is supported by Ullah *et al.* (2008), who found the highest flowers per plant in brinjal when combined application of cow dung and inorganic sources of nutrients.

Number of pods and pod length

The number of pods per plant is an important yield component to achieve highest chilli yield. The average number of pods and average pod length per chilli plants that was grown in different inorganic and organic fertilizer combinations were increased as the time period increased after transplanting as shown in the Table 2.

Table 2: Number of pods per plant and pod length of chilli plants grown under different fertilizer combinations at 120 and 150 days after transplanting (DAT).

	120 DAT	150 DAT	120 DAT	150 DAT
T1	0.50c	6.25d	2.3d	2.35d
T2	3.50b	15.25c	2.97cd	2.85c
T3	10.75a	19.00b	3.6bc	3.43b
T4	8.25a	23.50b	3.9ab	4.30a
T5	10.50a	24.50a	4.53a	4.73a
F test	P < 0.01	P < 0.01	P < 0.01	P < 0.01
Treatments	Number of green pods per plant		Average pod length	

The data represents means of four replicates.

Mean values in a same column having the similar letter/letters indicate not significant differences at 1% level of significance by DMRT.

T₁- No fertilizer (Control plot), T₂- 100% Inorganic fertilizers, T₃- 50% Inorganic cattle manure (15 t ha⁻¹), T₄- 50% Inorganic fertilizers + cattle manure (15 t ha⁻¹) + burnt paddy husk (250 kg ha⁻¹), T₅- 50% Inorganic fertilizers + cattle manure (15 t ha⁻¹) + burnt paddy husk (500 kg ha⁻¹)

From the data, it seemed that pod formation in chilli plants were positively influenced of nutrients applied. The maximum number of pod per plant (10.75) was observed in 50% IF + cattle manure (15 t ha⁻¹). However, it did not show any significant different with treatment T₅ where the average numbers of 10.5 pods per plants were observed at 120 DAT. This results in conformity with Kendaragama (1999) who observed similar results in tomato and chilli to application of organic materials.

Average pod length was significantly (p<0.01) influenced by different types and amalgamation of the fertilizers at 120 and 150 DAT. Plants grown without any fertilizer minimum pod length of 2.30 cm while the maximum (4.53) was recorded in treatment DAT. Minimum and maximum pod length of 2.35 cm and 4.73 cm was recorded in and treatment T₅ respectively at 150 DAT. It might be due to adequate supply of plant macro and micro nutrients using pod length from cattle manure and partially burnt paddy husk for the pod formation and development.

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5. Conclusions, implications and significance

The results revealed that application of the organic fertilizers such as cattle manure and partially burnt paddy husk leads to increase plant pod yield of chilli. The recommended Inorganic fertilizers yielded the highest chilli yields compared to control (No any fertilizer added plots) while combined application of the organic resources tested in this study increased in chilli yield. In this study, the integrated application of

50% RIF + cattle manure (15t ha⁻¹) along with partially burnt paddy husk (500kg ha⁻¹) gave higher green pod yield of chilli.

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