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## Effect of combined application of organic and inorganic fertilizer on growth attributes of wheat (*Triticum aestivum* L.)

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### Abstract

A field experiment was conducted in Randomized Block Design with three replications in the field of School of Agriculture, Lovely Professional University, from 1st December 2017 to 28th April 2018 to study Combined application of inorganic and organic fertilizer and effects on growth attributes of wheat cultivation (*Triticum aestivum* L.). Different plots were treated with different level of vermicompost and recommended dose of fertilizers viz., T<sub>1</sub>= 100% RDF; T<sub>2</sub>= 75%RDF + 25% Neem Coated Urea; T<sub>3</sub>= 50% RDF + 50% Neem Coated Urea; T<sub>4</sub>= 75%RDF + 25% Vermicompost; T<sub>5</sub>= 50% RDF + 50% Vermicompost; T<sub>6</sub>= 50% RDF + 25% Neem Coated Urea + 25% Vermicompost with control T<sub>0</sub>. Result revealed that application of (50% RDF + 50%NCU) recorded significantly highest growth attributes (Plant height (cm), Number of tillers, Leaf length (cm)) after 30, 45, 60, 75 and 90 DAS.

**Keywords:** Neem coated urea, growth attributes, wheat, inorganic fertilizer

### Introduction

Wheat is major staple food of India. It is a cereal crop that cultivated extensively throughout the world (Khatkar *et al.*, 2016) <sup>[4]</sup>. It is *Rabi* seasonal crop and is widely grown in various climatic zones. Wheat can be cultivated under wide range of soils and reported to be cultivated on both rainfed and irrigated lands (Mishra *et al.*, 2014) <sup>[6]</sup>. India being ecologically diverse country became among the top major producers and consumers of wheat at global level. Approximately, 30.22 mha area of India under wheat cultivation with production of around 93.50 mt (Anonymous, 2018) <sup>[1]</sup>. Among Indian states, Punjab contributes to highest wheat of 3.46 mha with production of 17.63 mt (Anonymous, 2018) <sup>[1]</sup>.

As population is increasing day by day so, to minimize the hunger of the world need to improve wheat crop production. So, application of organic and inorganic fertilizer is the best way to improve wheat production. Application of urea is the best source to enhance soil productivity. Because of the hygroscopic nature of urea more than 60% of nitrogen leaching down or turn to vapor in the form of nitrogen gas (N<sub>2</sub>), ammonia(NH<sub>3</sub>), nitrous oxide(N<sub>2</sub>O) due to the presence of denitrifying bacteria in the soil (Ladha *et al.*, 2005) <sup>[5]</sup>. But direct application of urea causes the leaching of nitrogen in soil which is not used by plants for growth and development.

After the extraction of neem oil from neem seeds neem cake generally used as concentrated organic manure but now it is used for coating the urea and improving the nitrogen use efficiency. Recently government of India allowed and motivated to coat the nitrogen with neem cake. It having several benefits in application to crop not only save the urea but also it act as repellent for pest and insects. Application of neem coated urea releases nitrogen slowly and increase nitrogen use efficiency in crop production. National Fertilizer Limited (NFL) started production of Neem Coated Urea (NCU) in the year 2002. Sunita and Narang (2012) <sup>[10]</sup> reported that use of Neem Coated Urea has been found to improve the uptake of N, P and K significantly.

The combined use of organic and inorganic fertilizers is effective ways to maintains nutrient supply, gives organic carbon to soil microbes, and mobilizes soil-bound nutrients on decomposition through the release of organic acids (Sharma *et al.*, 2013). Integration of inorganic fertilizers with organic manures and bio-fertilizers will not only help sustain the crop productivity but also will be effective in improving soil health and increase the nutrient-use efficiency (Verma *et al.*, 2006) <sup>[11]</sup>. Keeping this view in mind, an experiment was planned to know the combined use of organic and inorganic fertilizers for improving growth attributes of wheat crop.

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## Material and Methods

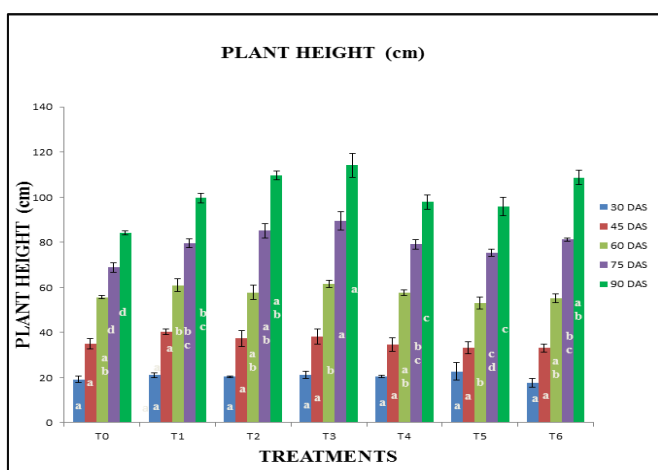
The trial was conducted at the Agricultural Research Farm of Lovely Professional University, Phagwara. Wheat (cv. HD2967) obtained from Wheat Research Station, Punjab Agricultural University, Ludhiana for combined study of organic and inorganic fertilizers. Different plots were treated with different treatments of organic and inorganic fertilizers viz., T<sub>0</sub>(control), T<sub>1</sub>(100% RDF), T<sub>2</sub>(75% RDF+25% neem coated urea), T<sub>3</sub>(50%RDF+50% neem coated urea), T<sub>4</sub>(75% RDF+25% vermicompost), T<sub>5</sub>(50% RDF+50% vermicompost), T<sub>6</sub> (50%RDF+25% neem coated urea+25% vermicompost). The experimental area was 500m<sup>2</sup> were it is divided into 21 plots, the size of each plots were 4m x 6m. The plots which represent different treatments were placed in Randomized Completely Block Design replicated with three times. Observations were recorded after 30, 45, 60, 75 and 90 days after sowing. Observations were collected for Growth attributes viz., Plant height (cm), Number of tillers, Leaf length (cm). Statistical data were analyzed as per method given by Panse and Sukhatme (1985).

## Result and Discussion

### Plant Height

The data on plant height (cm) of wheat as affected by use of vermiompost and inorganic fertilizers after 30, 45, 60, 75 and 90 days of sowing are presented in Figure 1.

Effect of organic and inorganic fertilizers on plant height (cm) of wheat affected non- significantly after 30 and 45 days of sowing, while significantly affected after 60, 75 and 90 days of sowing (Fig. 1). Application of 50% RDF+50% Neem coated urea recorded significantly highest plant height after 60, 75 and 90 days of sowing and it was 61.67, 89.48 and 114.19 cm respectively. Where significantly lowest plant height (cm) was recorded by application of 50%RDF+50%vermicompost (T<sub>5</sub>) after 60 days of sowing and after 75 and 90 days of sowing lowest plant height was recorded by plot without treatment (T<sub>0</sub>). Neem coated urea (NCU) releases nitrogen in very less quantity and it is as per required quantity for normal growth and development of plant. Singh *et al.*, (2006) [9] studied that the modifications in fertilizer source and/or management can lead to reduced losses of N, high wheat yields and increased fertilizer N-use efficiency. Performance of neem coated urea @ 96 kg N ha<sup>-1</sup> drilled during sowing of wheat was better than neem-coated urea applied @ 120 kg N ha<sup>-1</sup> in 2 split doses at Ludhiana. Similar result were reported by Jadon *et al.*, (2018) [3] in maize.



**Fig 1:** Effect of vermicompost and inorganic fertilizers on plant height (cm) of wheat at 30, 45, 60, 75 and 90 DAS.

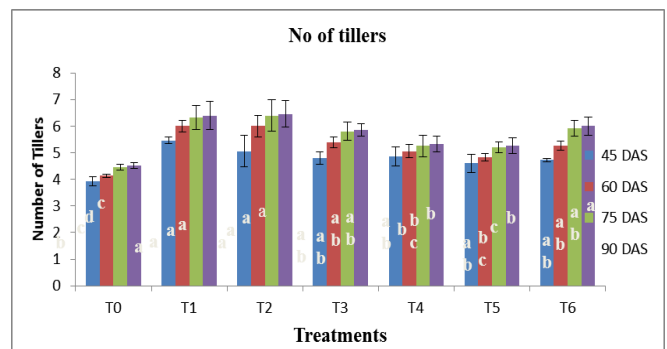
Where, DAS: Days after sowing. Data are in the form of Mean  $\pm$ SEM at  $p < 0.05$ . The mean followed by different letters was significantly different at  $p < 0.05$ , according to DMRT for separation of Means.

T<sub>0</sub> = control; T<sub>1</sub> = 100% RDF; T<sub>2</sub> = 75% RDF + 25% Neem coated urea; T<sub>3</sub> = 50% RDF + 50% Neem coated urea; T<sub>4</sub> = 75% RDF + 25% vermicompost; T<sub>5</sub> = 50% RDF + 50% vermicompost; T<sub>6</sub> = 50% RDF + 25% Neem coated urea + 25% vermicompost.

### Number of tillers

Number of tillers in wheat affected by application of organic and inorganic fertilizers after 45, 60, 75 and 90 days after sowing reported in figure 2.

Effect of organic and inorganic fertilizers affected significantly on number of tillers in wheat after 45, 60, 75 and 90 days of sowing (Figure 2). Application of 100%RDF recorded significantly maximum number of tillers per plant (5.46) after 45 days of sowing, while significantly maximum number of tillers after 60, 75 and 90 days of sowing were recorded by application of 75%RDF+25%Neem coated urea it was 6, 6.4 and 6.46 respectively, significantly minimum number of tillers was recorded by plot without application of organic and inorganic fertilizers (T<sub>0</sub>) after 45, 60, 75 and 90 days of sowing. Arshdeep *et al.*, (2019) reported that application of neem coated urea enhance the formation of number of productive tillers this is due to required availability of nitrogen to the plant. Application of 75% recommended N through neem coated urea to pearl millet recorded maximum numbers of productive tillers (Gangurde, *et al.*, 2018) [2].



**Fig 2:** Effect of vermicompost and inorganic fertilizers on number of tillers of wheat at 45, 60, 75 and 90 DAS.

Where, DAS: Days after sowing. Data are in the form of Mean  $\pm$  SEM at  $p < 0.05$ . The mean followed by different letters was significantly different at  $p < 0.05$ , according to DMRT for separation of Means.

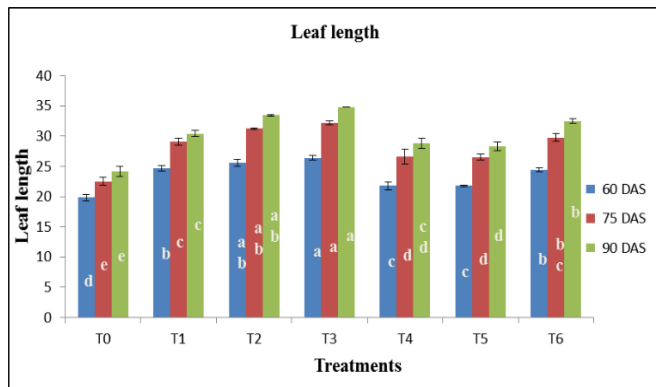
T<sub>0</sub> = control; T<sub>1</sub>=100% RDF; T<sub>2</sub> = 75% RDF + 25% Neem coated urea; T<sub>3</sub> = 50% RDF + 50% Neem coated urea; T<sub>4</sub> = 75% RDF + 25% vermicompost; T<sub>5</sub> = 50% RDF + 50% vermicompost; T<sub>6</sub> = 50% RDF + 25% Neem coated urea + 25% vermicompost.

### Leaf length

Data pertaining effect of organic and inorganic fertilizer application on leaf length (cm) are presented in figure 3.

Application of organic and inorganic fertilizer application on leaf length (cm) affected significantly after 60, 75 and 90 days of sowing (Fig. 3). Application of 50%RDF+50% Neem coated urea (T<sub>3</sub>) resulted significantly maximum leaf length after 60, 75 and 90 days of sowing and it was 26.38, 32.15 and 34.79 cm respectively, while significantly minimum leaf

length (19.82, 22.52 and 24.14 cm) were recorded by plot without any application of organic and inorganic fertilizers (Control T<sub>0</sub>) after 60, 75 and 90 days of sowing. Nitrogen is essential element for chlorophyll synthesis and leaf elongation and it require mostly in vegetative growth stage so neem coated urea released nitrogen affect long time. Similar result were reported by (Gangurde, *et al.*, 2018) [2] and Jadon *et al.*, (2018) [3] in maize.



**Fig 3:** Effect of vermicompost and inorganic fertilizers on leaf length (cm) of wheat at 60, 75 and 90 DAS.

Where, DAS: Days after sowing. Data are in the form of Mean $\pm$ SEM at  $p < 0.05$ . The mean followed by different letters was significantly different at  $p < 0.05$ , according to DMRT for separation of Means.

T<sub>0</sub> = control; T<sub>1</sub> = 100% RDF; T<sub>2</sub> = 75% RDF + 25% Neem coated urea; T<sub>3</sub> = 50% RDF + 50% Neem coated urea; T<sub>4</sub> = 75% RDF + 25% vermicompost; T<sub>5</sub> = 50% RDF + 50% vermicompost; T<sub>6</sub> = 50% RDF + 25% Neem coated urea + 25% vermicompost.

### Conclusion

Application of neem coated urea releases nitrogen very slowly as per requirement of plant and it shows better effect in plant vegetative growth parameters and organic manure maintain the soil biological activity. This study concluded that application of neem coated urea with organic manure helps to improve crop stand and vegetative growth of the plant.

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