Effect of Fertility Levels and Cow Urine Foliar Spray on Growth and Yield of Wheat

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A B S T R A C T

A field experiment was conducted in the rabi season on Integrated Farming System at BHU, Varanasi to evaluate the effect of different level of fertility and cow urine foliar spray on growth, yield and yield attributes of wheat (Var-HUW 234). The grain yield and straw yield of wheat varied significantly under varying levels of fertility and cow urine foliar sprays. The experiment was conducted under the split plot design with three replications. However, the response of fertility levels (RDF = 120-60-60-25 kg ha⁻¹ of NPKZn levels) to the improvement of grain and straw yield was positively correlated and the same was also true in case of grain and straw yield increment with the spray of cow urine. The Cow urine foliar sprays (four) were done at 20 days interval from 30 DAS to 90 DAS to study the effect on growth and yield of wheat. It was reported that application of 80% and 100% RDF, respectively recorded 10.37% and 20.46% higher grain yield over 60% RDF. Moreover, application of 50%, 75% and 100% cow urine spray recorded 2.69%, 18.01% and 27.21% higher grain yield, respectively over control.

Keywords
Cow urine spray,
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Introduction

Farming system (FS) has been generally mentioned everywhere as a combined effort of crop and livestocks (cattle). Wheat is one of the most important cereal crop in the world. In India, wheat is the second most important staple cultivated food after rice and consumed by nearly 65% of the Indian population (Mishra et al., 2005) and rank first in dietary shares in northern India represented by Gangetic plains (Joshi et al., 2007). Presently, wheat accounts for 96.64 MT (2016-17). But, the growth in production has led to India now being the world’s second largest producer of wheat. However, the increasing imbalanced and indiscriminate use of chemical fertilizers leads to deterioration of soil health and fertility. So, integrated nutrient management (INM) is the most appropriate and adoptable practice in which both organic and inorganic sources of nutrients is included, with an objective to increase crop production without deterioration of soil fertility. The concept of organic farming has been gaining momentum with the use of different manures with the liquid organic manures can help to maintain optimum crop yield by maintaining the fertility status (Arun Kumar et al., 2014). The integrated use of inorganic fertilizers with the
liquid organic manures (cow urine) can help to maintain optimum crop yield by maintaining fertility status of the soil. Cow urine contains 95% water, 2.5% urea, and 2.5% minerals, salts, hormones and enzymes. It also contains essential minerals like iron, calcium, phosphorus, carbonic acid, potash, nitrogen, ammonia, manganese, sulphur, phosphates and potassium, urea, uric acid, amino acids, enzymes, cytokinin, lactose etc. (Bhadauria, 2002). Research shows that only 20% of nitrogenous materials consumed by cattle are absorbed and 80% is excreted in urine and dung. The beneficial effect of cow urine application has been reported on several crops such as on mustard (Gupta, 2005, Meena et al., 2013 and Pradhan et al., 2016), Maize (Devakumar et al., 2014), and Sweet corn (Pande et al., 2015), and on vegetables such as on Watermelon (Burubhai and Eribo, 2012), Chilli (Keduka et al., 2014) and Lablab bean (Maheshari et al., 2017). With these facts, the present study entitled the effect of fertility levels and cow urine foliar spray on growth, yield and yield attributes of wheat.

**Materials and Methods**

A study was conducted at the Agricultural Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi during *rabi* seasons of 2015-16 on the wheat variety named HUW-234. The experiment was laid out in split plot design with three main plots and four sub plots and that was replicated thrice. The main plot factors are F1-60% of recommended dose of fertilizer (120-60-60-25 kg ha⁻¹ of N, P₂O₅, K₂O and ZnSO₄), F₂- 80% RDF and F₃- 100% RDF, respectively. The subplots were U₀- water spray, U₁- 50% cow urine spray, U₂- 75% cow urine spray and U₃- 100% cow urine spray. The half dose of N and full doses of P₂O₅ and K₂O was applied as basal dose and remaining one-fourth of N was applied as first top dressing and second top dressing at 40 DAS and 60 DAS respectively. Four foliar sprays of cow urine at 30, 50, 70 and 90 DAS were applied to observe the effect of cow urine on growth, yield and yield attributes of wheat. The seed sowing was done with the spacing of 22.5 cm × not maintained. The observations were recorded on the various aspects pertaining to growth parameters viz. plant height, LAI and yield attributes such as number of ear m⁻², number of grain ear⁻¹, Test weight (g), Grain yield and straw yield etc.

**Results and Discussion**

**Growth**

Plant height, LAI of wheat plant varied markedly due to different soil fertility levels and cow urine as foliar sprays in different concentrations. Taller plants and higher tiller numbers at all the stages of plant growth were found in highest fertility levels and maximum cow urine concentration as foliar sprays. In 2015 data, the fertilizer applied at 100% RDF produced significantly taller plants than 60% RDF at all the growth stages. It was evident that wheat plants supplied with adequate amount of major nutrients (100% RDF) produced more leaves and prolific roots for supply of nutrients and water and hence brought about greater accumulation of photosynthates, yielding more height, LAI (70 DAS) in all the growth stages (Table 1).

The growth attributing characters progressed presumably because of better supply of nitrogen and other major, secondary and micro-nutrient at higher rate of urine application. The different enzymes and hormones present in cow urine are also lead to better growth of plant (Vahanka et al., 2010).

**Yield attributes**

Yield attributes such as ears m⁻², grains ear⁻¹, 1000-grain weight, and improved remarkably due to increase fertility levels from 60 to 100% RDF in the experimental year, 2015-16.
Table.1 Effect of fertility levels and cow urine spray (Four foliar spray) on growth of wheat

| Treatments          | Plant height (cm) | Leaf Area Index |
|---------------------|------------------|-----------------|
|                     | 40 DAS | 70 DAS | At Harvest | At 70 DAS |
| Fertility Levels    |        |        |            |           |
| 60% RDF             | 32.31  | 93.73  | 92.02      | 3.37      |
| 80% RDF             | 33.00  | 97.19  | 93.52      | 3.49      |
| 100% RDF            | 34.15  | 98.19  | 99.08      | 3.76      |
| SEM±                | 0.34   | 0.85   | 0.88       | 0.03      |
| CD at 5%            | 1.33   | 3.33   | 3.45       | 0.13      |
| Cow Urine spray     |        |        |            |           |
| Control             | 32.806 | 94.81  | 92.94      | 3.32      |
| 50% CU              | 33.056 | 95.22  | 93.53      | 3.49      |
| 75% CU              | 33.389 | 96.08  | 94.83      | 3.56      |
| 100% CU             | 33.361 | 99.36  | 98.19      | 3.80      |
| SEM±                | 0.606  | 1.12   | 1.26       | 0.04      |
| CD at 5%            | NS     | 3.34   | 3.73       | 0.11      |

Table.2 Effect of fertility levels and cow urine spray (Four foliar spray) on yield attributes of wheat

| Treatments          | Ear numbers per square meter | Grain numbers per ear | Test weight (g) |
|---------------------|------------------------------|-----------------------|-----------------|
| Fertility Levels    |                              |                       |                 |
| 60% RDF             | 290.75                       | 35.28                 | 37.32           |
| 80% RDF             | 296.42                       | 37.52                 | 37.73           |
| 100% RDF            | 314.75                       | 39.51                 | 40.28           |
| SEM±                | 3.97                         | 0.72                  | 0.49            |
| CD at 5%            | 15.61                        | 2.84                  | 1.94            |
| Cow Urine spray     |                              |                       |                 |
| Control             | 284.33                       | 92.9                  | 37.48           |
| 50% CU              | 297.11                       | 93.5                  | 38.04           |
| 75% CU              | 305.44                       | 94.8                  | 38.71           |
| 100% CU             | 315.67                       | 98.2                  | 39.53           |
| SEM±                | 5.61                         | 1.26                  | 0.48            |
| CD at 5%            | 16.67                        | 3.73                  | 1.42            |
Table 3 Effect of fertility levels and cow urine spray (Four foliar spray) on yield of wheat

| Treatments               | Grain Yield (q/ha) | Straw Yield (q/ha) | Harvest Index (%) |
|--------------------------|--------------------|--------------------|-------------------|
| **Fertility Levels**     |                    |                    |                   |
| 60% RDF                  | 27.46              | 40.48              | 40.41             |
| 80% RDF                  | 30.31              | 41.50              | 42.20             |
| 100% RDF                 | 33.08              | 45.16              | 42.28             |
| SEm±                      | 1.05               | 0.64               | 0.80              |
| CD at 5%                  | 4.14               | 2.53               | 2.40              |
| **Cow Urine spray**      |                    |                    |                   |
| Control                  | 27.04              | 40.54              | 40.01             |
| 50% CU                   | 27.77              | 41.50              | 40.08             |
| 75% CU                   | 31.93              | 43.11              | 42.55             |
| 100% CU                  | 34.40              | 44.37              | 43.67             |
| SEm±                      | 1.19               | 0.86               | 0.90              |
| CD at 5%                  | 3.54               | 2.56               | 2.70              |

Dig: 100% fertility levels and 100% cow urine treated experimental plot
The highest values of ears m⁻², grains ear⁻¹, 1000-grain weight, and in 2015 were recorded with 100% RDF. So, 100% RDF was distinctly superior to other fertility levels. The increased grain yield at higher fertility level may be attributed to the increased vegetative growth and better availability of nutrients during growth period, more synthesis of carbohydrates and their translocation (Muthuswamy et al., 1990 and Minhas and Sood, 1994, Mondal et al., 2013, Singh et al., 2014 and Srivastava et al., 2014). Consequently, the highest values of ears m⁻², grains ear⁻¹, 1000-grain weight, and during 2015 were recorded with 100% foliar spray of cow urine (Table 2).

Yield

Grain yield in the year of experimentation (2015 - 2016) showed significant variation due to 100% fertility levels and 100% cow urine as foliar spray. It was reported that application of 80% and 100% RDF, respectively recorded 10.37% and 20.46% higher grain yield over 60% RDF. Moreover, application of 50%, 75% and 100% cow urine spray recorded 2.69%, 18.01% and 27.21% higher grain yield, respectively over control (Table 3).

The highest grain yield was noticed at 100% RDF and also at 100% foliar spray of cow urine. It was noticed that grain yield of rice was improved with increasing concentration of cow urine from control to 100% in the year (2015 - 2016). Straw yield also increased with each increment of fertility level up to the highest level. Application of 50%, 75% and 100% cow urine recorded 2.36%, 6.33% and 9.44% higher straw yield, respectively than control. It is apparent from the data that the fertility levels able to influence the harvest index to the level of significance in the year (2015 - 2016). Similarly, linear trend was noticed in harvest index with different concentrations of cow urine application as foliar spray.

On the basis of the result obtained from the experiment, it can be concluded that 100% RDF and four sprays of cow urine should be rice to be proved most effective in increasing growth and yield of wheat under the integrated farming system.

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