HortFlora Research Spectrum
Vol. 7, Issue 2; 159-161 (June 2018)
www.hortflorajournal.com
ISSN: 2250-2823
NAAS Rating : 3.78

EFFECT OF CATTLE URINE ON TOMATO CROP

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ABSTRACT : Nepal is a mountainous country having an area of 1, 47,181 square kilometer with predominantly an integrated agriculture practice. Realizing the possibilities of cattle excreta for agro-production this experiment is design to compare the production of tomato in application of cattle Urine with different dilution level. Experimental plots were categorized into three types, a Common farmer practice plot, Treatment (with different dilutions of cows urine) plots and Chemical used plots. Tomato production analysis was done with three replications. Urine water dilution level of 1:2, 1:4, 1:6, 1:8, and 1:10 is sprayed in the plots. Plants height and yield was measured, soil sampling and NPK in Urine was analyzed, and disease and infestations are observed finally Cost- Benefit analyses are done. The most recommendable urine water dilution level for higher yield of tomato production from this research is found as 1:8.

Keywords : *Cattle urine, plot experimentation, dilution ratio, yield*

Nepal is a mountainous country with a predominantly agricultural based economy but low and declining soil fertility has been recognized as a significant cause for the stagnation or decline in crop productivity (Pandey *et al.,*5). Urine from a livestock shed makes good organic fertilizer and is called liquid manure, is rich in nitrogen (taken up as NO_3^- or NH_4^+), phosphorus (taken up as $H_2PO_4^-$), and potassium (taken up as K^-) with sufficient organic matter similarly to many mineral fertilizers, either processed natural minerals or manufactured chemicals (Isherwood, 6). Lumle Agriculture Research center (4) observed cattle urine as one of the best pest control in farming. Furthermore, urine in manure may contain significant levels of nitrogen and phosphorous which threaten water resources in a watershed if not managed correctly. It should be used or stored or disposed properly, if not it may pose health and environmental hazards (Gelfand *et al.,* 3). The main objective of this study is to analyze the right ratio of urine and water for better tomato production. So that the right dose of urine applications can be recommended. It is also to study the valuable composition of cattle urine (N, P, K) as an alternative resource of fertilizer. It also gives scope to compare the cost benefit analysis of tomato production in three different farming systems.

Article's History:
Received: 06-05-2018 ***Accepted: 20-06-2018***

MATERIALS AND METHODS

Variety of local tomato *Lycopersicum esculentum* (Local name: Lumle) seedlings were used for the test.

All total 24 experimental plots of 1.51 m^2 were designed. Three variations of treatment plots were made one organic practice plot (OP), another organic plus urine experimental plot (UW) and third was organic plus chemical fertilizer plot (CF). Five different ratios of urine: water proportion such as 1:0, 1:2, 1:4, 1:6, 1:8, 1:10 were used for application. All the experiment trial plots were made in three replications. Eight numbers of seedlings were maintained in each plot, with inter-plant distance of about 31cms. Sprayer was used for the application of urine in the plots. During early stage of the plant one liter of diluted urine per week per plot was applied. After flowering, one and half liter of urine per week per plot was sprayed till fruits developed and ripened.

Soil sample from organic and chemical used plots were analyzed for chemical and physical property before the experiments. NPK of Urine was also analyzed. Nitrogen analysis was done by Macro-Kjeldahl method, Phosphorus analysis was done by using spectrophotometer, Potassium analysis was done by using Flame-Photometer. The samples were analyzed at Soil and Water Analysis Laboratory of Kathmandu University based on Blake and Hartge (1) methods of soil analysis.

Throughout the growth stage Plants height was measured once a week; 4 plants from each plot were

selected randomly for that purpose. Yields of ripen tomatoes were harvested in every 7, 5, 3, 2 days according to needs; and total amount of production was calculated for each week. The first flowering, first fruiting, fist harvest, last harvest, total production periods, diseased and pest infestation were also observed and analyzed. Cost-benefit analysis was done in keeping the gate price value of tomato per kg. Organic market was not explored for this purpose.

RESULTS AND DISCUSSION

From the laboratory analysis of soil sample, the pH values before the experiment in the OP plot were higher than CF plots. Whereas NPK % in OP and CF plots before treatment have not shown significant difference. Urine was analyzed to calculate the needed NPK value for tomato crop given in table 1. According to Edmundo *et al.* (2), Nitrogen requirement for tomatoes is 120kg/ha. Thus according to table 1 to fulfill the Nitrogen requirement in 1 hectare, 34682 liters of Urine is required. If N requirement is maintained by application of cattle Urine then amount of potassium will exceed the requirement value for the tomato plant. To balance the nutrient requirement and to find appropriate practical solution to the farmer; treatment experimentation of the best dilution level was carried out. The concentration of NPK is also shown in Table 1 below.

Table 1 : Composition of NPK in urine.

	N (g/L)	P (g/L)	K (g/L)
Cattle Urine	3.4563	0.124	8.2
34682 Liters/ha	120 kg	4.300 kg	284.39 kg
UW 1:2	1.152	0.042	2.73
UW 1:4	0.692	0.025	1.64
UW 1:6	0.49	0.018	1.16
UW 1:8	0.38	0.014	0.91
UW 1:10	0.3114	0.01	0.74

Fig 1 below depicts the best plant height achieved by UW 1:0; nearly same result was also shown by UW 1.8; ironically CF plots were found with most stunted plants. The reason can be improper use of chemical and ignorance of the farmer. T_4 (UW 1:8) and T_5 (UW 1:10) showed highly productivity with the yield of 30.13 t/ha and 29.93 t/ha. Statistically, T_7 (CP) also gave similar yield compare to T_4 and T_5. The CF yielded comparable yield with T_1, T_2, T_6 but lesser than T_4, T_5 and T_7. This result is seen more clearly in the Figure 2.

Statistical analysis shows that there is a significant difference between the treatments at 5% level and significant difference in the yield obtained from eight different treatments that are 0.022 at 95% confident level

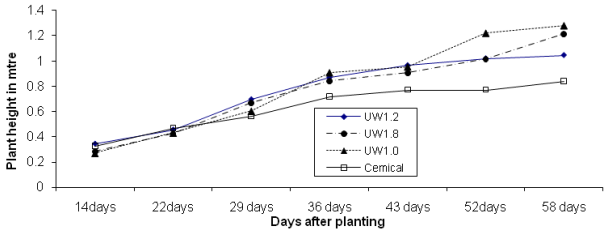

Fig 1: Plants Height Measurement

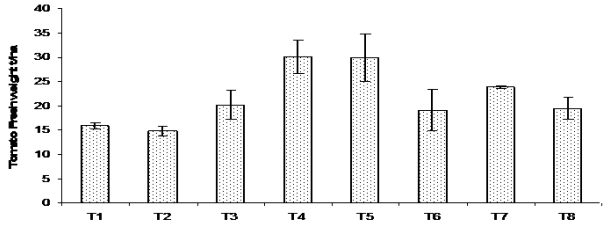

Fig 2: Mean yield of fresh tomato (t/ha)

The economic analysis done per hectare also shows that benefit obtained from UW 1:8 over CF is ₹ 320880 and benefit CP is ₹ 52148. It clears that the use of OP is more beneficial than CF. On top of it cattle urine use is the most beneficial if it is used with the ratio of water and Urine 1:8 or 1:10.

CONCLUSION

The result obtained from all the treatment was statistically analyzed and was found significantly different *i.e.* p= 0.022 at 95% confident level. The higher yield was obtained in urine water ratio1:8 and 1:10 i.e. 30.13 and 29.93 tonn per hectare respectively, whereas yield obtained from chemical fertilizer applied treatment was 19.54 tonn/ha. The maximum plant height was observed in treatment plot 1:0. From the cost benefit analysis the net benefit obtained from chemical fertilizer applied treatment was ₹ 5,24,892 per hectare whereas the net benefit obtained from cattle urine water ratio 1:8 was ₹ 8,45,772 per hectare .This result shows the net benefit by using UW 1:8 is more by ₹ 3,20,880 per per ha in a season.

Hilly farm of Nepal is an integrated farming; where cattle are domesticated for milk and manure production. Cattle urine has never been trapped nor been able to recover its resources. This result shows

that cattle urine is very beneficial for more vegetable production and is best substitute to chemical fertilizer for environmentally friendly cultivation in hill farms of Nepal. The most recommendable urine water dilution level for higher yield of tomato production is 1:8.

Acknowledgement

This experimentation was carried out in support of Eco-Organic Nepal at Eco-organic farm, Pachkhal Ward No 7, Kavre District, Nepal.

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Citation : Khanna S.A.,Bajracharya R.M. and Karmacharya R. (2018). Effect of cattle urine on tomato crop. *HortFlora Res. Spectrum,* **7**(2) : 159-161