Tropentag 2009, University of Hamburg, Germany

International Research on Food Security, Natural Resource Management and Rural Development

Effects of local resources and nitrogen on soil water pH and yield of lowland rice in Nepal

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Introduction

Rice is the most preferred staple food crop of Nepal fulfilling more than 50% of the calorie requirement contributing 25% of the agricultural gross domestic product and 50.4% of the total food grain production in the country. Lowland rice is principal source of rice production, however, productivity of lowland rice in Nepal is very low as compared to many developed and developing countries.

Research problem

Among several limiting factors, nutrient especially nitrogen management under lowland rice field comes to forefront. Nitrogen fertilizer applied in the lowland rice is subjected into several fates of which loss through NH_3 volatilization is important and is the function of floodwater temperature and pH. The rapid loss of N through NH_3 volatilization under high pH is related to the growth of algae in the floodwater. As a result of depletion of CO_2 in the water by algal growth, the pH rises as high as 9 by mid-afternoon leading to loss of Nitrogen.

Objectives

- To monitor the effect of local mulch materials on **floodwater pH of lowland rice.**
- To measure the yield of lowland rice as affected by conjoint use of mulching materials and inorganic nitrogen.

Materials and methods

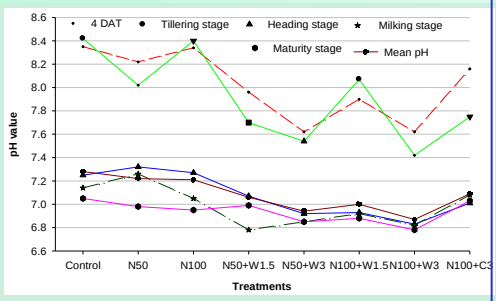
- Experiment was laid out in RCBD with 10 treatments and four replication conducted under subtropical humid condition of Nepal.
- Floodwater pH was measured at an interval of 4 days at 12 noon in randomly selected three spots using automatic pH meter.
- LAI was measured using automatic leaf area meter at key growth stages.
- Yield attributes and yield have been calculated.
- Data were subjected to analysis of variance and DMRT for mean separations.

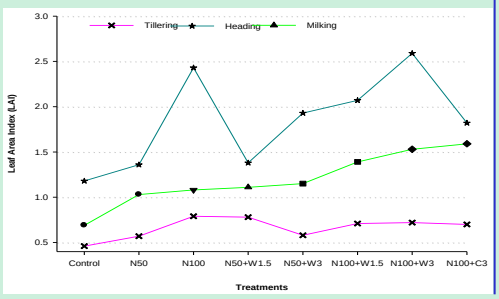
Treatment combination
Control - N_0
Nitrogen @ 50 kg/ha - N_{50}
Nitrogen @ 100 kg/ha- N_{100}
Nitrogen @ 50 kg/ha + Wheat mulch @ 1.5t/ha- $N_{50}+W_{1.5}$
Nitrogen @ 50 kg/ha +Wheat mulch @ 3t/ha- $N_{50}+W_3$
Nitrogen @ 100 kg/ha +Wheat mulch @ 1.5t/ha- $N_{100}+W_{1.5}$
Nitrogen @ 100 kg/ha +Wheat mulch @ 3t/ha- $N_{100}+W_3$
Nitrogen @ 100 kg/ha +*Cassia tora* @ 3t/ha- $N_{100}+C_3$
Nitrogen @ 50 kg/ha + *Cassia tora* @ 3t/ha- $N_{50}+C_3$
Nitrogen @ 50 kg/ha + *Ipomoea fistulosa* @ 3t/ha- $N_{50}+I_3$

Results

Treatment	Test wt (gm)	Yield (t/ha)
N_0	16.93^{e}	2.61^{e}
N_{50}	17.69^{b-d}	3.00^{d}
N_{100}	17.73^{bc}	3.35^{bc}
$N_{50}+W_{1.5}$	17.20^{c-e}	3.11^{d}
$N_{50}+W_3$	17.40^{b-e}	3.13^{cd}
$N_{100}+W_{1.5}$	17.31^{b-e}	3.23^{b-d}
$N_{100}+W_3$	18.28^{a}	3.66^{a}
$N_{100}+C_3$	17.78^{b}	3.44^{ab}
$N_{50}+C_3$	17.17^{de}	3.20^{b-d}
$N_{50}+I_3$	17.33^{b-e}	3.33^{bc}
CD (5%)	0.47	0.25

- The mean maximum and minimum pH was recorded under nitrogen-omitted treatment (7.28) and 100 kg N plus 3 t/ha of wheat straw mulch (6.87) respectively.
- pH of floodwater declines with higher amount of mulching materials with different levels of nitrogen.
- The grain and straw yields were higher with 100 kg N and 3 t/ha of wheat mulch discernibly showing that less nitrogen have been lost through volatilization.
- There was significant relationship between pH and test weight (r=-0.789**), pH and grain yield (r=-0.754**), $LAI_{heading}$ and yield (r=0.65*) and test weight and yield (r= 0.88**).





conclusions

As NH_3 volatilization is the pH driven phenomena, straw mulch applied in rice field with modest amount of inorganic nitrogen fertilizer is considered effective in decreasing pH of floodwater concomitantly improving the nitrogen use efficiency in rice, save the water bodies; soil and aerial environment vis-à-vis provide better production at lower cost.

Contact
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