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# *Influence of Rice Straw Utilization as Compost on Rice Productivity*

**By**

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# Summary

A field experiment was carried out to investigate the effect of NPK levels and organic materials application on the performance of Egyptian hybrid rice during 2017 and 2018 rice growing seasons at the Experimental Farm of Rice Research and Training Center, Sakha, Kafr-El-Sheik, Egypt. The main objective of this study is to understand the integration effect between mineral and organic fertilization on the behavior of Egyptian Hybrid Rice One cultivar.

The experiment was laid out in spilt- plot design based on RCBD in four replications, where the main plots were assigned to NPK fertilizers and sub- plots were allocated to organic materials. The NPK fertilizers levels were control (without any mineral fertilizes application, 1/3, 2/3 and full dose of NPK. The full dose of NPK (recommended dose) is 165 $KgNha^{-1}$, 36 kg $P_2O_5$ $ha^{-1}$ and 58 kg $K_2O$ $ha^{-1}$. The organic materials treatments were control (without any organic materials application), rice straw compost, farm yard manure, chopped rice straw and chopped rice straw mixed with farm yard manure. The application rate of the organic materials was 7 tons per hectare. Plant samples were randomly taken from each plot at 30, 45 and 60 DAT to estimate leaf area index, dry matter accumulation and plant height. Grain yield and its attributes were estimated at harvest.

# Summary

**The obtained results can be summarized as follows:**

**1- Growth characteristics:**

The application of NPK fertilizer levels resulted in a significant increase in leaf area index, dry matter accumulation at different growth periods (30, 40 and 60 DAT) in both seasons. These characters were gradually increased by increasing NPK up to full dose at all studied growth periods.

Leaf area index, dry matter accumulation and plant height were found to be significantly affected by the application of organic material treatments in the two seasons. Data indicated clearly that plants received either rice compost or farm yard manure exhibited significant increase in these traits compared with control (without organic materials application) in both seasons.

**2- Grain yield and its attributes:**

**Yield attributes**

NPK levels affected significantly yield attributes. Increasing NPK levels from zero up to full dose increased significantly number of panicles per hill, panicle weight, number of grains per panicle and percentage of filled grains in both seasons. While a reverse trend was observed for l000-grain weight, thus low grain weight decreased significantly with the application of NPK fertilizer.

Application of rice straw compost or farm yard manure increased significantly each of panicles per hill, panicle weight, number of grains per

panicle and filled grains percentage over the control. There were no significant differences between application rice either straw compost or farm yard manure on the above mentioned traits except the number of grains per panicle in the 2017 season. The application of organic materials did not show any significant difference in 1000- grain weight in both seasons.

**Grain and straw yields:**

Application of NPK fertilizer gradually increased grain and straw yields up to hull dose of NPK. Also, application of rice straw compost or farm yard manure increased significantly grain and straw yields over the control point. On the other hand, no significant differences were detected among control; rice straw application and combined application of rice straw and farm yard manure on grain and straw yields.

The interaction effects between NPK levels and organic materials were significant for panicle weight, number of grains per panicle, grain and straw yields in both seasons. While, the number of panicles per hill was affected by interaction in 2017 only. Moreover, the filled grain percentage was influenced significantly by the interaction in 2018 only. 1000 grain weight was not affected by the interaction in the two seasons.

**3- NPK uptake by plant samples, rice grain and straw:**

Nitrogen, phosphorus and potassium uptakes at different growth periods as well as by grain and straw were affected significantly by the application of NPK and organic materials as well as the interaction in both seasons. The uptake of nitrogen, phosphorus and potassium at growth periods and by rice grain increased after adding NPK fertilizers and organic

materials. The highest uptake for the three nutrients was increased gradually with each increment of NPK fertilizer up to the highest level (full dose). Incorporation any of organic materials into the soil increased significantly the nitrogen and phosphorus uptakes at different growth periods and by rice grain. All organic materials applications boosted the uptake of potassium by rice plant and grain, except rice straw treatment. The maximum increases in nitrogen, phosphorus and potassium uptakes of rice pant at growth periods and by rice grain were with the application of compost or farm yard manure. The application of a full dose of NPK integrated with compost or farm yard manure incorporating enhanced the uptake of nitrogen, phosphorus and potassium recorded the highest values. The lowest values of nitrogen uptake were detected at zero NPK under zero, rice straw, rice straw with FYM incorporation treatments. The plots which did not received any NPK fertilizers or organic materials produced the lowest values of phosphorus uptake without any significant differences with those which received rice straw alone. Potassium uptake was the lowest in control plots without application of NPK fertilizers or organic materials.

**4- Chemical analysis of rice soil**

The availability of ammonium, nitrate, potassium, phosphorus and zinc (ppm) in the soil decreased with progressive plant age from 30 DAT till harvest in both seasons. The available of all the mentioned nutrients in the soil at different growth periods (30, 45 and 60 DAT) and harvest were significantly increased by increasing application of NPK fertilizer levels and organic materials treatments in both seasons.

# Summary

The interaction between NPK fertilizer and organic materials treatments in the availability of all the mentioned nutrients in the soil had significant effects at different studied growth periods and harvest, except on nitrate available at 30 DAT in 2017 and potassium available at 45 and 60 DAT in 2017 season. The application of a full dose of NPK combined with compost or farm yard manure produced the highest values of all the mentioned nutrients availability in the soil at 30 DAT, except for available potassium, whereas, the highest amount of K available were obtained at 45 DAT in both seasons.

**Soil organic matter percentage**

Organic matter percentage (OM %) at harvest affected significantly by NPK levels and organic material treatments application in the two seasons. The significant increase in organic matter percentage was a companied with each increment of organic materials. The highest values of organic matter were recorded when plots received full dose of NPK fertilizer combined with rice compost or farm yard manure in both seasons.

**5- Grain quality characteristics**

NPK levels influenced significantly milling, hulling and head rice percentage in the two seasons. Rice plants received NPK fertilizer up to full dose recorded high hulling, milling and head rice percentages than those without NPK fertilizer in the two seasons. Application of rice straw compost or farm yard manure increased hulling, milling and head rice percentages. The highest values were recorded when NPK was applied at level of full dose combined with rice straw compost or farm yard manure. However, the lowest values were found in plots free from fertilizer.

# Conclusion

It could be concluded that the integrated use of organic materials and inorganic fertilizer significantly increase the grain yield, yield components of Egyptian hybrid rice variety. The highest values of grain yield, yield components were recorded when NPK plus organic materials were used. Combined mineral NPK with farm yard manure or rice straw compost could increase NPK uptake by rice grain and organic matter content in the soil .