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SUMMARY and CONCLUSION

Two field experiments were executed at the experimental farm of the faculty of Agriculture Saba-Basha, University of Alexandria, Egypt, during 2008 and 2009 seasons. These experiments were carried out to study the effect of nitrogen levels (40, 60, 80, 100 Kg N/fed) and hill spacings (15x15, 20x20 and 25x25 cm) on the performance of the Egyptian Hybrid rice H1 (**SK**-2034H).

A split plot design was used in both seasons with three replicates where, the main plots were devoted to nitrogen levels; while, hill spacings were allocated in the sub-plots.
    The studied characters were titled in four main topics as follow:

A- Growth characters:
1. Number of days to heading (days),
2. Plant height (cm.),
3. Panicle length (cm.),
4. Culm length (cm.),
5. Leaf area index (LAI),

B- Yield and Yield components:
1. Number of panicles/hill (plant),
2. Number of spikelets/panicle.
3. Number of filled grains/ panicle,
4. One thousand Grain weight,
5. Grain yield (ton/fed).

C- Some yield related characters:
1. Number of tillers/hill (plant),
2. Fertility percentage (%),
3. Harvest index (HI),
4. Straw yield (ton/fed),
 5. Biological yield (ton/fed).

D- Grain Quality characters:

1. Grain physical characters:

a. Grain length (mm),
b. Grain width (mm),
c. Grain shape,

2. Milling characters:
a. Hulling (%),
b. Milling (%),
c. Broken rice (%).

3. Cooking and Eating Quality:
a. Kernal elongation (%),
b. Amylose content (%),
c. Protein content (%).

The resulted findings of the present investigation in the two seasons of study could be summarized as follow:

A- Growth characters

A-Effect of nitrogen fertilization:
The resulted findings indicated that, all growth characters; number of days to heading, leaf area index, plant height and Culm length, of rice Hybrid 1 were affected significantly by nitrogen levels except panicle length in both seasons. The mean values of all affected characters by nitrogen application showed increasing trend accompanied with the increase in nitrogen level from 40kg N/fed to 80kg N/fed, because in most cases the differences between 80kg N/fed and 100kg N/Fed. That in turn declares that 80kg N/fed is the most favorable and efficient nitrogen level for most growth characters except for number of days to heading because it induce significant delay in heading which are not objected.

B- Effect of planting distances:
The performance of growth characters; number of days to heading, leaf area index, plant height and Culm length, as affected by planting distance was differed from character to another and from season to other season of study. This effect was not significant for number of days to heading and panicle length in the two seasons indicating that these characters had minimum effect of the environment. On the other hand leaf area index, number of tillers/hill (plant) and number of spikelets/panicle in both seasons, plant height and culm length were affected significantly in 2008

season only indicating the differences in the environment conditions occurred in both seasons.

C- Interaction effect:
Interaction effect between nitrogen levels and planting distances on the growth characters was not significant in general for all characters and in both seasons. This in turn suggests that both variables have its own way of action on these characters under the conditions of the present investigation.

B- Yield and Yield components:

A-Effect of nitrogen fertilization:
Grain yield(ton/fed) and yield component characters; number of panicles/hill, number of spikelets/panicle, number of filled grains/panicle and 1000 grain weight of the Egyptian Hybrid rice were significantly affected by nitrogen application in 2008 and 2009 growing seasons. Increasing nitrogen level accompanied with gradual increase in the mean values of all characters and minimized at 40kg N/ fed and maximized at 80 and/or 100kg N/fed. Accordingly, it might recommend that 80kg N/fed is the most favorable nitrogen level to optimize grain yield ant its component in one hand and it is the most efficient in the other hand.

B- Effect of planting distances:
It was clear that grain yield and its component characters; grain yield(ton/fed) and yield component characters; number of panicles/hill, number of spikelets/panicle, number of filled grains/panicle and 1000 grain weight were significantly affected by planting distances in both seasons of study ,except 1000-grain weight in both seasons. The lowest values of such character were found at the narrow distance (15x15 cm) while, the maximum mean values were resulted at 20x20 cm distance an in turn it appeared to be the most recommended distance for planting the Egyptian Hybrid rice.

C- Interaction effect:
In respect to the effect of the interaction between nitrogen fertilization and planting distance on grain yield and yield components was not significant in the two seasons. This result concludes that, both studied factors affect such trait independently.

C- Yield related characters

A-Effect of nitrogen fertilization:
The results concluded be that all yield related characters of Hybrid 1 rice investigated under the present study were significantly affected by nitrogen application in 2008 and 2009 growing seasons. In general it could be seen that increasing nitrogen level accompanied with gradual increase in the mean values of all characters; Number of tillers/hill, Fertility percentage, Harvest index, straw yield(ton/fed) and biological yield and minimized at 40kg N/ fed and maximized at 80 and/or 100kg N/fed. Accordingly, it might recommend that 80kg N/fed is the most favorable nitrogen level and the most economic level in order to optimize the mean values of yield related characters.

B- Effect of planting distances:
Number of tillers/hill, Straw yield (ton/fed) and Biological yield were significantly affected by planting distances in both seasons. Fertility percentage was affected in the second season only. Harvest index didn't show any effect due to planting distance. Meantime, the lowest values of remaining characters were found at the narrow distance (15x15 cm) while, the optimum mean values were resulted at 25x25 cm distance with insignificant differences with 20x20 cm apart in most cases and in turn it appeared to be the most recommended distance for planting the Hybrid 1 rice.

C- Interaction effect:
In respect to the effect of the interaction between nitrogen fertilization and planting distance on yield related characters was significant for biological yield and harvest index in both seasons. Obviously, an increasing trend in the mean values of these characters was detected under increasing nitrogen level and widening the planting distance. However, insignificant interaction effect was resulted in case of straw yield character in both seasons indicating that, both studied factors affect such trait independently.

D- Grain quality characters:

1- Grain physical characters:
A-Effect of nitrogen fertilization:

The discussed result proved that, different nitrogen application levels didn't affect all the grain physical characters i.e.; grain length (L), grain width (W) and grain shape (L/W ratio) in the two seasons of study.

B- Effect of planting distances:
These characters were significantly affected and highly significantly by planting distance variables in both seasons except the cases of grain width and grain shape in 2008 season.

C- Effect of interaction:
The effect of the interaction between nitrogen application methods and planting distance on all the grain physical characters was not significant in both seasons.

2-Milling Characters:

A-Effect of nitrogen fertilization:
From the aforementioned findings it is clear that all milling characters of Hybrid 1; Hulling percentage and broken rice percentage in both seasons were significantly affected by nitrogen levels except milling percentage in season 2009 only. The mean values of all affected characters by nitrogen application showed increasing trend accompanied with the increase in nitrogen level from 40kg N/fed to 80kg N/fed except for broken rice % which decreased significantly by increasing nitrogen application level. In most cases the differences between 80kg N/fed and 100kg N/Fed were not significant including broken rice %. This in turn declares that, 80 kg N/fed is the most favorable and efficient nitrogen level for milling characters.

B- Effect of planting distances:
The differences of all milling characters Hulling percentage and Milling percentage as affected by planting distance was not significant in the two seasons except broken rice % in 2008 season only, indicating that, these characters had minimum effect of the environment. On the other hand, broken rice % significantly affected in 2008 season only indicating the differences in the environment conditions occurred in both seasons.

C- Interaction effect:
Interaction effect between nitrogen levels and planting distances on the milling characters was not significant in general for all characters in two seasons except broken rice % in 2008 season. This in turn suggests that,

both variables have their own mode of action on these characters under the investigation conditions.

3- Cooking and eating quality characters

A-Effect of nitrogen fertilization:
It could be concluded that cooking and eating quality characters; Amylose content percentage and protein content percentage except kernel elongation of Hybrid rice 1 investigated were highly significantly affected by nitrogen application in the two seasons. In general, it is clear that increasing nitrogen level was accompanied with gradual increase in the mean values of all eating quality characters and minimized at 40kg N/ fed while, maximized at 80 and/or 100kg N/fed. Accordingly, it might be recommend that 80kg N/fed is the most favorable nitrogen level and the most efficient level in order to optimize the mean values of these characters.

B- Effect of planting distances:
It was clear that protein content character, only, was significantly affected by planting distances in both seasons of study. However, both kernel elongation and amylose content characters didn't show any effect due to planting distance. Meantime, the lowest values of all cooking and eating quality characters were found at the narrow distance (15x15 cm) while, the optimum mean values were resulted at 25x25 cm distance with insignificant differences with 20x20 cm apart in most cases . Finally, the most recommended distance for planting the Hybrid rice 1 in order to get the most preferable cooking and eating quality characters.

C- Interaction effect:
In respect to the effect of the interaction between nitrogen fertilization and planting distance on cooking and eating quality characters was significant for protein content only in the two seasons. Obviously, an increasing trend in the mean values of this character was detected under increasing nitrogen level and widening the planting distance. However, insignificant interaction effect was resulted in case of kernel elongation and amylose content characters in both seasons indicating that both studied factors affect such traits independently.

Recommendation:

  This study clarified that fertilizing Egyptian rice variety "hybrid 1" with 80 kg N/fed and transplant the seedlings at 20x20 cm is the most sufficient way to obtain highest grain yield and best grain quality.