

Influence of Maxicrop on Agronomical Attributes and Yield of Four Rice Varieties in Kebbi, North-Western Nigeria.

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Abstract
The use of Bio stimulants in rice production is gaining more ground day by day. A two year experiment was conducted during the dry season of 2016 and 2017 in a flood plain area, around Jega, Kebbi state to determine the influence and optimum level of maxicrop application on four varieties of rice. The treatment evaluated consisted of four improved rice varieties (FARO 44, 52, 60 and 61) and three levels of maxicrop application (0, 2 and 4L/ha), applied at 4 and 8 WAT, factorially combined and laid in a randomized complete block design (RCBD) and replicated three times. From the outcome of the result, it shows that FARO 44 has a significant difference in number of tillers in 2016 with maxicrop inclusion level of 2 L/ha compared to other varieties, also in 2016 the influence of maxicrop level at 2 L/ha was significantly higher in FARO 44 with the highest yield/ha (6664.41Kg) compared to the other varieties while in 2017, FARO 44 has the highest yield/ha (6366.31Kg) and FARO 52 is least (6164.55Kg). Therefore, the application of maxicrop at 2 L/ha increased the yield/ha of all the four varieties of rice with FARO 44 been the highest
Keywords: Rice varieties, Maxicrop and Yield.

1.0 Introduction.

Rice (*Oryza sativa* L) has become one of the leading food staples in Nigeria, Surpassing cassava in food expenditure. Currently, rice consumption has increased faster than production, resulting in a growing dependency on imports. By 2014, about half of the rice consumed in Nigeria was imported, been the most populous country in Africa south of the Sahara (SSA), Nigeria has quickly become the leading importer of rice on the continent and, more recently, in the world. Kwabena, G.B., Michael, J., and Hiroyuki, T. (2016)

This growing dependence on rice imports is a major concern of Nigeria`s government, and since the early1980s numerous programs have been implemented to encourage domestic rice production and achieve rice self-sufficiency, Ukwungu, M.N and Abo, M.F. (2013). In particular, rice featured prominently in the Agricultural Transformation Agenda (ATA), which has guided the Federal Ministry of Agriculture and Rural Development (FMARD) and also the current green alternative of this administration. Trade policies have also been used in an attempt to slow the growth in imports, with import tariffs on milled rice increasing to 110 percent beginning in 2013. In spite of these policies, the Nigeria rice sector has yet to be transformed into a more productive one that can compete with foreign imports. This situation is not unique to Nigeria and applies to the rest of south sahara Africa (SSA), where the sector`s slow growth has puzzled many international donors and research communities (Otsuka and Larson 2012).

Considering the current fertility of the predominance soils in this agro ecological zone, which are very low in nitrogen content, Lombin, (1987), and also low in some micro nutrients which also play a key role in overall rice production; having good and improved rice seeds and adoption of good agronomical practices can also be boosted with the application of good Bio stimulants which is usually foliar applied. Recently, there were lot of Bio stimulants for foliar spray in rice production, which aids in boosting production due to some micronutrients deficiencies in our soils which these Bio stimulants provided, among these is maxicrop. Most research on maxicrop were carried on other crops and their performance were commendable, hence the need to study the performance of maxicrop on some selected rice varieties commonly used by our farmers in this area was conceived under the same management condition, as this will ameliorate the rate of nutrients lost through leaching, runoff and volatilization in the case of nitrogen.

1.1 Materials and Methods.

The experiment was carried out in a flood plain farm in Jega, close to Kebbi State University of Science and Technology (KSUSTA) Research farm located in Jega, which is at the coordinate (N12^{0}12,140 E004^{0}22.082) during the dry season of 2016 and 2017. Both disturbed and undisturbed soil samples were taken at depths of 0-10cm and 10-20cm with auger and core sampler in the experimental site before land preparations. The treatment evaluated consisted of four commonly used improved rice varieties (FARO 44, 52, 60 and 61) and three levels of maxicrop applications (0, 2 and 4 L/Ha). The treatments were factorially combined and laid down in a randomized complete block design (RCBD) replicated three times. The entire field was wetted, then sprayed with glyphosate at the rate of 2.0 Kg a.i ha^{-1} in order to control already emerged weeds and the previous year ratoon prior to land preparation. A separate nursery was established for all the four varieties concerned around the edge of the field. The nurseries were established on 7/2/16 and 13/2/17, respectively, thereafter, the land was ploughed, puddled and leveled after 14 days. The bonds of beds were raised (4×4m) manually with hoe before transplanting of the seedlings. The seedlings were transplanted on 10/3/16 and 18/3/17, respectively using transplanting rob at inter and intra row spacing of 20 × 20cm apart, using one seedling per stand. Immediately after transplanting, the entire plot was flooded with water for three days and was also spread with pendimethalin at the rate of 1.2a.iKg Ha^{-1}. One week after transplanting, all missing stands were gap filled and basal application of NPK 15:15:15 was applied at the rate of 40Kg/Ha, thereafter, nitrogen fertilizer (Urea) was applied in two split doses at 3 and 6 weeks after transplanting (WAT) at the rate of 30Kg/Ha each. The application of fertilizer was done by broadcasting and prior to fertilizer application, weeding was done at 3 and 6 WAT, and hand pulling continues in the field as the need arises.

The maxicrop was applied as par treatment in two split doses at 4 and 8 WAT at the rate of (0, 2 and 4 L/Ha using a knapsack sprayer. The application was usually done early in the morning and a polyethene shield was used at the edge of the treatment plot in order to avoid drifts to another treatment plot.

Data were collected on the following parameters; Plant height prior to harvest, total numbers of tillers per stand, panicle length and yield/Ha.

1.2 Results and Discussion

The result of the soil analysis (table 1) showed that 0-10cm was Sandy clay loam while 10-20cm was Clay loam with low amount of nitrogen, phosphorus and potassium, with bulk density of 1.16$gcm^{-3}$and 1.24 gcm^{-3}, respectively. The influence of maxicrop levels of inclusion on rice varieties is presented on table 2. FARO 52 has the highest plant height across the three level of maxicrop application while FARO 44 has the least plant height.

There is significant difference in number of tillers in FARO 44 at 2L/ha level of maxicrop application in 2016 compared to the other three varieties (Table 3), FARO 44 produced significantly longer panicle length in both 2L/ha and 4L/ha level of maxicrop application in 2016, while in 2017 at 4L/ha level of maxicrop application, FARO 44 is significantly longer while FARO 61 is least (Table 4).

In 2016, the influence of maxicrop level at 2L/ha was significantly manifested in FARO 44, with the highest yield (6664.41Kg/ha) compared to the other three varieties, while in 2017, the same trend was observed at the same level of 2L/ha of maxicrop application, where FARO 44 has the highest yield/ha (6366.31Kg/ha) while FARO 52 is least (6164.55Kg/ha) though at par with FARO 60 and 61.

The positive responses of those parameters at 2L/ha level of maxicrop application could complement some of the limiting nutrients and made them very available and suitable for the production of assimilates that resulted in higher yields compared with the control (0 L/ha) and beyond 2L/ha application level, there could be some antagonistic effects which may limit the utilization of even the nutrients available for the plant use. The results from soil samples analyzed showed (Table 1) that the soil is poor in available soil nutrients, thus the complementary roles of maxicrop becomes necessary. This is in agreement with the findings of Lombin (1987) who reported that Savannah soils are poor in inherent fertility, easily leached, have low organic matter content, low CEC and poor buffering capacity. The complementary roles of maxicrop level at 2L/ha through the foliar application will cushion the effects of some loses in fertility from the soil.

Among the four varieties, it was observed that FARO 52 produced taller plants than the other three. This could be attributed to the genetic makeup of the plant, as it has been reported that FARO 52 can grow above 120cm in well deep water (Africa Rice, 2016).

1.3 Conclusion

The results obtained from the experiment showed that application of maxicrop at 2L/ha at 4WAT and 8 WAT for all the four varieties produced the highest yield, where FARO 44 is the best (6664.41Kg/ha)

Table 1 Physical and chemical properties of the soil of the experimental site.

Depth	**0-10cm**	**10-20cm**
Particle size distribution (g/kg)		
Sand	543	445
Silt	235	275
Clay	222	280
Textural class	Sandy clay loam	Clay loam
Bulk Density (gcm^{-3})	1.16	1.24
Chemical properties		
pH in 0.01m CaCl2	5.0	5.4
pH in 0.01m H_20	5.4	5.9
Organic carbon (gkg-1)	9.8	7.4
Total N (gkg-1)	0.77	0.70
Available P (mgkg-1)	0.96	0.91
Exchangeable bases (cmolkg-1)		
Ca	0.65	0.50
Mg	0.95	0.90
K	1.44	1.21
Na	0.65	0.43
CEC	8.2	7.6

Soil samples as analyzed by Soil Science Department, Ahmadu Bello University, Zaria, Kaduna State.

Table 2:Influence of maxicrop on plant height at different levels

	2016			2017		
MAXICROP LEVEL(L/Ha) / VARIETY	0	2	4	0	2	4
FARO 44	103.64^{d}	103.57^{d}	103.67^{d}	104.13^{d}	104.00^{d}	107.70^{d}
FARO 52	125.77^{a}	126.13^{a}	126.40^{a}	125.87^{a}	126.57^{a}	126.37^{a}
FARO 60	122.37^{b}	121.63^{b}	119.73^{b}	119.93^{b}	120.20^{b}	119.70^{b}
FARO 61	114.83^{c}	115.40^{c}	114.87^{c}	114.87^{c}	115.23^{c}	115.10^{c}
SE±	0.70	0.70	0.70	0.70	0.70	0.70

Table 3: Influence of maxicrop on number of tiller per stand

	2016			2017		
MAXICROP LEVEL(L/Ha) / VARIETY	0	2	4	0	2	4
FARO 44	62^{a}	63^{a}	60^{a}	60^{a}	62^{a}	62^{a}
FARO 52	61^{a}	61^{b}	61^{b}	61^{a}	62^{a}	62^{a}
FARO 60	61^{a}	61^{b}	61^{b}	61^{a}	61^{a}	61^{a}
FARO 61	62^{a}	61^{b}	60^{a}	61^{a}	62^{a}	61^{a}
SE±	0.63	0.63	0.63	0.63	0.63	0.63

Table 4: Influence of maxicrop on panicle length

	2016			2017		
MAXICROP LEVEL(L/Ha) / VARIETY	0	2	4	0	2	4
FARO 44	34.27^{a}	34.80^{a}	35.00^{a}	33.53^{a}	34.27^{a}	35.07a
FARO 52	32.13^{b}	32.37^{c}	32.90^{b}	32.07^{b}	32.43^{c}	32.83^{b}
FARO 60	33.40^{a}	33.33b	32.70^{b}	33.07^{a}	33.33^{b}	32.60^{b}
FARO 61	30.40^{c}	31.20^{d}	30.83^{c}	30.50^{c}	30.93^{d}	30.73^{c}
SE±	0.32	0.32	0.32	0.32	0.32	0.32

Table 5: Influence of maxicrop on yield per hectare at different levels of application

MAXICROP LEVEL(L/Ha) / VARIETY	2016			2017		
	0	2	4	0	2	4
FARO 44	6320.92[a]	6664.41[a]	6407.59[a]	6013.05[a]	6366.31[a]	6108.75[a]
FARO 52	6162.17[b]	6376.21[b]	6364.98[b]	5923.82[ab]	6164.55[b]	6104.16[a]
FARO 60	6102.62[b]	6337.94[b]	6134.11[c]	5960.79[ab]	6252.88[b]	6058.15[a]
FARO 61	6177.35[b]	6328.48[b]	6206.98[c]	6065.26[a]	6219.21[b]	6097.82[a]
SE±	34.39	34.39	34.39	34.39	34.39	34.39

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