Comparative Study on the Production of Upland Rice (Oryza sativa) Grown in Kindu Varieties: KISASA, ONU, MOMBE and DIMENA, Lwama I Site

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ABSTRACT

The experiment was carried out in the DRC in the province of Maniema, city of Kindu, more precisely in the university site Lwama I. The general objective of this study was to conduct a comparative study on the production of upland rice (Oryza sativa) grown in Kindu in the case of the varieties: KISASA, ONU, MOMBE and DIMENA, Lwama I site. Indeed, it had the following specific objectives: to determine the growth-related behaviors of each variety studied, and to compare the production level of the varieties studied.

In the course of this study, the hypotheses were put forward: (a) The varieties of rainfed rice farmed in Kindu are said to have different behaviors related to growth, and (b) There are reportedly productive varieties of upland rice in the city of Kindu. To achieve this, we conducted a field experiment with a randomized complete block device with 4 treatments and 4 replicates.

The following results were obtained: (1) For the emergence rate, the ONU variety was the best with 79.33% followed by the DIMENA variety with 60.45%; (2) For tillering, the UN variety 36 tillers followed by the MOMBE variety with 14 tillers; (3) For the diameter at the collar, the ONU variety was the best with 3.40cm followed by the MOMBE variety with 2.69cm; (4) For the height of the plants, the variety DIMENA obtained the high height with 74.27cm followed by the variety MOMBE with 51.55cm; (5) For the number of grains per panicle, KISASA was the best with 209.91 followed by the DIMENA variety with 199.41; (6) For grain weight per plot, the MOMBE variety was better with 1.93. The highest yield was observed in T1 (DIMENA) with 835.64 Kg/ha and the lowest yield is 678.12 Kg/ha observed in T4 (KISASA). The average is 721.8 Kg/h. Statistically, no variety was superior to the other in terms of yield.

At the end of this study, we say that our hypotheses have been verified and our objectives have been achieved. To do this, we suggest the following: (1) It is up to the growers to use the DIMENA variety which was better in this study followed by the KISASA variety whose yield was satisfactory; (2) It is up to the researchers to deepen this study in order to address the other aspects that have not been covered.

Keywords: study, comparison, production, rice, Kindu

INTRODUCTION

Rainfed rice was introduced to the Democratic Republic of Congo in the fifteenth century by the Arabs. It was only around the 1950s that the country experienced irrigated rice cultivation on an experimental basis with the assistance of the Taiwanese government (Mbodj, 1991).

In the Democratic Republic of Congo, rice cultivation remains the prerogative of small producers, cultivating an average of 0.50 ha of dry crops and 0.20 ha of flooded crops, with yields of one tonne of paddy per hectare. In terms of consumption, rice is in seventh place with 2.5% of national demand. Kinshasa leads the way with a consumption of 27% of the national

volume consumed. It is followed by Orientale Province, Kasai Central, Maniema and North Kivu with 18%, 10.3%, 7.5% and 6.1% respectively. Kinshasa's demand alone accounted for 33% of global supply, and consumption increased sharply throughout the country (Mansy, 2014).

It should be noted, however, that several varieties of rice grown in the province of Maniema are degenerated and have become susceptible to attacks by diseases and pests. Producers still use local varieties of upland rice, although their production is low. This is due to the lack of availability of improved varieties (Jack cited by Emongo, 2014).

All the cultural practices used by farmers represent an abundant source of knowledge for researchers to know about pests and also to adopt measures to protect rice cultivation (Ngama, 2018).

Rice is a staple food for the people of Maniema in general and the city of Kindu in particular. It is grown on small areas and often attacked by leafminers or stem borers which are responsible for the transmission of several diseases that do not allow good production (Autrique, 1981).

In view of the problem mentioned above, this study asks the following questions:
- What are the behaviors related to the growth of rice varieties grown in Kindu?
- What would be the most productive rice variety in Kindu?
  To answer this problem, we put forward the following hypotheses:
- The varieties of upland rice farmed in Kindu are said to have different behaviours linked to growth,
- There are reportedly productive varieties of upland rice in the city of Kindu.

The general objective of this study was to conduct a comparative study on the production of upland rice (Oryza sativa) grown in Kindu in the case of the varieties: KISASA, ONU, MOMBE and DIMENA, Lwama I site.

Specifically, we have set ourselves the following specific objectives:
- Determine the growth-related behaviors of each variety studied,
- Compare the production level of the varieties studied.

MATERIALS AND METHODS

The study took place in the experimental site of Lwama commune of Mikelenge, DRC, in the province of Maniema, city of Kindu, in a period from July 2021 to April 2022, i.e. eight months.

Material

As part of this experimental study, we used rice seeds, including the most widely grown varieties in the city of Kindu: KISASA, UN, MOMBE and DIMENA In addition to seeds, we will also use the following technical equipment: GPS, decameter, camera, notebook, pen, machete, hoe, string, etc.

The characteristics of the varieties which were the subject of our research are shown in Tables 1 and 2.

Table 1: Technical characteristics of the upland rice varieties studied

N°	Varieties	Weight of 1000 seeds	Sowing time at flowering	Sowing time at maturity	Resistance to lodging	Persistence to destemming	Research Station Performance	Yield in peasant environments
1	Dimena	3 to 35 g	30 to 98 days	120 days	Strong	Average	2000 to 2500 Kg/Ha	1500 to 1800 Kg/ha
2	Onu	29 g	70 to 98 days	95 to 100 days	Good	Strong	5000 Kg/ha	2500 Kg /ha
3	Mombe	35 to 39 g	90 days	125 days	Good	Average	2500 kg/ha	1800 kg/ha
4	Kisasa	25 to 29 g	90 days	115 to 120 days	Quite durable	Quite sensitive	2800 to 3300 Kg	2000 to 220 Kg/ha

Table 2: Technical characteristics of the upland rice varieties studied

N°	Varieties	Dehulling yield	Bleaching performance	Breakage rate	Complement to baking	Firmness	Seed quality
1	Dimena	60 to 65%	83%	10%	125%	Pretty good	Low commercial value
2	Onu	63%	-	-	-	Good	Good
3	Mombe	70%	82%	11%	385 ml/100g	Pretty good	High commercial value
4	Kisasa	70 to 73 %	89%	7%	130%	Moderate	Good

Methods

To achieve our objectives and verify our hypotheses, we used the experimental method on the field. Which used a randomized complete block design comprising 4 treatments and 4 repetitions. The treatments consisted of different varieties of rice grown in Kindu.

Experimental Design

The observations focused on: Vegetative parameters and production parameters; Vegetative parameters Lift rate at 7 and 15 days; Plant height at 30, 60 and 120 days; Diameter at collar at 30,60 and 90 days; Number of tillers at 45 and 60 days. Production parameters Number of panicles per plant; Number of panicles per plot; Number of grains per panicle; 1000 grain weight; Grain weight per plot; Yield.

Data Processing

The raw data were entered into Excel, statistics x software was used to make all statistical calculations. Two-way classification analysis of variance was done to determine whether F is significant or not. If F calculated > F theoretical at the 5% threshold, there is no difference between the treatments as to the parameter studied. If calculated F < theoretical F at the 5% threshold, the test is significant and we consider that there is at least one variety which differs from the others, with respect to the parameter considered. In this case, we will use the least significant difference test to classify the four varieties (MISENGA, 2014).

RESULTS AND DISCUSSION

After analyzing the data obtained during this investigation, we present the results in the tables and fugues followed by their interpretations as well as their discussions.

Vegetative Parameters

Table 3 shows emergence rate and number of tillers per variety.

Table 3: Emergence rate and number of tillers by variety

Treatments	Emergence rate		Highest number	
	7 days	**15** days	**45** days	**60** days
T1	1,31	60,45	4	12
T2	7,76	79,33	9	36
T3	1,28	49,74	4	14
T4	00	14,53	3^b	9
X	2,64	51,06	5	18
CV %	107,21	21,20	27,33	24,19
PPDS	1.,5	6,83	0,90	2,76

Legend: T1: DIMENA, T2: ONU, T3: MOMBE, T4: KISASA, X: moyenne, CV (%): coefficient of variation in percentage, PPDS: smallest significant difference.

According to the emergence rate at 7 days, the variety T2 (ONU) had the highest rate of 7.76% and T4 (KISASA) did not emerge. The average of all treatments was 2.64%. The highest emergence rate at 15 days was observed in T2 (ONU) with 79.33% and the lowest in treatment T4 (KISASA) with 14.53% and the average of all varieties is 51.06 % The highest number of tillers at 45 days is 9 tillers observed in treatment T2 (UN) and the lowest number is 3 tillers observed in T4 (KISASA), the average is 5 tillers. The highest number of tillers at 60 days was observed in T2 (UN) with 36 tillers per plant; and the lowest number in T4 (KISASA) with 9 tillers, the average of the treatments is 18 tillers.

Table 4 shows the height and crown diameter of rice plants at different durations in days.

Table 4: Plant height and diameter at the collar

Treatments	The highest plant heigh (cm)				The highest collar (mm)		
	30 days	60 days	90 days	120 days	30 days	60 days	90 days
T1	8,83	25,48	74,27	153,12	0,79	1,88	2,82
T2	7,37	19,13	34,63	149,23	0,77	2,16	3,40
T3	10,58	27,36	51,55	173,78	0,70	1,96	2,96
T4	6,51	23,43	62,7	159,87	0,52b	$1,60^c$	2,94
X	8,32	23,85	55,84	127,36	0,69	1,90	3,03
CV %	20,36	20,68	22,01	4,45	29,40	9,30	10,12
PPDS	1,07	7,77	4,24	4,24	-	0,11	0,19

Legend: T1: DIMENA, T2: ONU, T3: MOMBE, T4: KISASA, X: moyenne, CV: coefficient of variation, PPDS: smallest significant difference NS: The decision is insignificant and insignificant.

The means followed by the same letter in the columns are not statistically different from 5% and 1% probability respectively. The highest plant height at 30 days was observed in T3 (MOMBE) with 10.58 cm and the lowest height was observed in T4 (KISASA) with 6.51 cm. The highest height at 60 days was observed in T3 (MOMBE) with 27.36 cm and the lowest height is 19.13 cm in T2 (ONU). The highest height at 90 days was observed in T1 (DIMENA) with 74.27 cm and the lowest height is 34.63 in T2 (ONU). The highest plant height at 120 days was observed in T3 (MOMBE) with 173.78 cm and the lowest height was observed in T2 (ONU) with 149.23 cm. The highest diameter at the collar at 30 days was observed in T1 (DIMENA) with 0.79 cm and the lowest diameter was observed in T4 (KISASA) with 0.52 cm. The highest diameter at the collar at 60 days was observed in T2 (O NU) with 2.16 cm and

the lowest diameter was 1.60 cm in T4 (MOMBE). The highest collar diameter at 90 days was observed in T2 (UN) with 3.40 cm and the lowest diameter was observed in T2 (DIMENA) with 2.82 cm.

Production Parameters

Table 5 shows the results of the production parameters (number of panicles per plant, number of panicles per plot, number of grains per panicle, weight of grains per plot, weight of 1000 grains and the average yield (kg/ha).

Table 5: Production parameters

Treatments	Number of panicles per plant	Number of panicles per plot	Number of grains per panicle	Weight of grain per plot(g)	Weight 1000 grain weight	Yield
T1	9,95	810,5	199,41	1,337	0,06	835,64
T2	15,37	522	88,98	1,089	0,048	680,62
T3	12,17	650,4	130,52	1,93	0,052	693,12
T4	10,22	450,2	209,91	1,099	0,056	678,12
X	11,92	608,3	157,20	1,179	0,054	721,87
CV %	24,03	22,40	10,84	39,75	15,35	40,72
PPDS	10,78	86,16	10,78	-	5,29	-

Legend: T1: DIMENA, T2: ONU, T3: MOMBE, T4: KISASA. CV%: coefficient of variation, PPDS: smallest significant difference NS: the decision is not significant; Grain weight per plot and yield were not significant.

The highest number of panicles per plant is 15 panicles in treatment T2 (ONU) and the lowest number is 10 panicles in treatment DIMENA and in treatment T4 (KISASA). The average for this parameter is 12 panicles per plant. The highest number of panicles per plot is 811 panicles observed in treatment T1 (DIMENA) and the lowest number is 450 panicles in treatment T4 (KISASA), the average number of panicles per plot is 608 panicles. The highest number of grains per panicle is 209.91 grains observed in T4 (KISASA), the lowest number is 88.98 grains in T2 (ONU). The average of treatments is 157 grains per panicle. The highest 1000 grain weight is 0.056g at T4 (KISASA) and the lowest is 0.048g. The average is 0.054g. The highest yield was observed at T1 (DIMENA) with 835.64 Kg/ha and the lowest yield is 678.12 Kg/ha observed at T4 (KISASA). The average is 721.8 kg/h. Statistically, no variety was superior to the other in terms of yield.

DISCUSSION

According to our sample, four local varieties of upland rice DIMENA, ONU, MOMBE and KISASA were sown for experimentation. We note that: the ONU variety had the highest emergence rate than other varieties at 7 and 15 days after sowing. The same variety had the highest number of tillers at 45 days and 60 days. These results could be due to varietal characteristics. The MOMBE variety had a height greater than 30, 60 and 120 days compared to the other varieties. This would be due to the vegetative cycle of the said variety which had a long cycle compared to the others; it was harvested at 120 days while the others were harvested at 90 and 110 days. The DIMENA variety had a higher height at 90 days. According to the production results, the UN variety was observed to have low height, well bushy with high number of tillers. The DIMENA variety gave a high yield compared to other varieties and had a lower number of panicles per plant and per plot; it is also one of the local varieties appreciated by the farmers of the town of Kindu. The KISASA variety had a high number of grains per panicle than other varieties. The MOMBE variety had higher grain weight per plot and 1000 grain weight compared to other varieties.

CONCLUSION

This study had the general objective of carrying out a comparative study on the production of upland rice (Oryza sativa) cultivated in Kindu Case of varieties: KISASA, ONU, MOMBE and DIMENA, Lwama I site. Indeed, its specific objectives were: Determine the behaviors linked to the growth of each variety studied, Compare the level of production of the varieties studied. During this study the hypotheses were put forward: The varieties of rainfed rice exploited in Kindu have different behaviors linked to growth. There are productive varieties of rainfed rice in the town of Kindu. To achieve this, we conducted a field experiment with a randomized complete block design comprising 4 treatments and 4 repetitions.

At the end of this study the following results were obtained: For the emergence rate, the ONU variety was the best with 79.33% followed by the DIMENA variety with 60.45%. For tillering, the ONU variety with 36 tillers followed by the MOMBE variety with 14 tillers, For the diameter at the collar, the ONU variety was the best with 3.40cm followed by the MOMBE variety with 2.69cm, For plant height, the DIMENA variety obtained the highest height with 74.27cm followed by the MOMBE variety with 51.55cm, For the number of grains per panicle, KISASA was the best with 209.91 followed by the DIMENA variety with 199.41, For grain weight per plot, the MOMBE variety was better with 1.93. The highest yield was observed at T1 (DIMENA) with 835.64 Kg/ha and the lowest yield is 678.12 Kg/ha observed at T4 (KISASA). The average is 721.8 kg/h. Statistically, no variety was superior to the other in terms of yield.

At the end of this study, we say that our hypotheses have been verified and our objectives have been achieved. For this we suggest the following: Growers should use the DIMENA variety which performed better in this study, followed by the KISASA variety whose yield was satisfactory. Researchers are kindly asked to deepen this study in order to address other aspects that we have not touched.

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