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# Combined Effect of Doses of Fertilizers and Different Densities on Agronomic Parameters of Rice (Oryza Sativa) Adapted on Humid Area on the Valley of Benoué-Cameroon

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*Keywords:* *planting density, rice, doses, mineral fertilizers, yields.*

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*Strictly as per the compliance and regulations of:*

# Combined Effect of Doses of Fertilizers and Different Densities on Agronomic Parameters of Rice (*Oryza Sativa*) Adapted on Humid Area on the Valley of Benoué-Cameroon

Bertrand Wang-Bara [α], Philémon Kaouvon [σ], Cyrille Woulbo Biyack [ρ] & Yvonne Djeoufo [ω]

*Abstract-* Study was realized on July 2021, inside of the Institute of Agricultural Research for Development (IRAD). Main objective of study is to determine the dose of mineral fertilizers and densities which responses well to the rice culture especially of the variety Nerica L36 in a humid area of the valley of Benoué. Treatments are constituted of fourth levels of doses and repeated 3 times: T1 (0 kg NPKSB+100 Kg Urea/ha); T2 (150 kg NPKSB+100 Kg Urea/ha); T3 (200 kg NPKSB+100 Kg Urea/ha; T4 (250 kg NPKSB+100 Kg Urea/ha). Three densities were considered: De1=20 cm x 20 cm; De2=25cm x 25cm; De3=30 cm x 30 cm. Experimental design was a split-plot, with two factors: Factor 1 concerning dose of fertilizers and Factor 2 concerning variety of Rice (Nerica L36). Evaluation parameters were: the height of plant, the number of tillers, the number of panicles/plants, panicles length, heading date at 80 % and maturity date. Harvest data collected are: the number of grains/panicles, weight of 1000 grains, potential yields. The results showed that the effect of different doses especially the doses 2, 3, 4 were highly significant (P ≤0.05) in influencing height of plant, number of tillers, number of panicles/plants, length of panicles for all densities considered. These densities are considered like good for growing aspect of Rice. On the other hand, the densities 1 and 2 were good for the aspect of heading date at 80 % for the dose 1, 2 and maturity date with the dose 1. However, yields aspects were most significant (P ≤0.05) with the dose 2, 3, 4 on number of grains/panicles and potential yields especially, which permit to deduce that densities 1, 2, 3 were good for these yield parameters.

*Keywords: planting density, rice, doses, mineral fertilizers, yields.*

## I. Introduction

Rice (*Orysa sativa* (L)) culture represent the first cereal for human's food in the world and for around half of world populations (Courtois, 2007). Asiatic country remains dominant on economy of Rice with 90 % in terms of surfaces and production (Mendez, 2008). Countries which are more included are China, India and Indonesia which represent more than half of the world production. Latin America and Africa represent 10 % of the rest of the production (Mendez, 2008).

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In Africa, Rice culture is the third of sources of calories for the country (Adrao, 2009). Actual problems which Africa is confronted is that the local production does not never equal to the demand (Harold *et al.,* 2015). However, the production, estimated at 330.000 tons, is largely lower to the demand whose requirement is estimated to more than 600.000 tons. For satisfy this deficiency, Cameroon should refer to the importations. Rice takes the first place in the order of five principals food products of high consummation concerned by importation in Cameroon. Importations varies from 552.472 tons in 2000 for the values of 156.6 thousand billion of FCFA to 819.841 tons, equivalent of 212.6 thousand billion of FCFA in 2013, after decreasing from 728.443 tons for the values of 183.7 thousand billion milliards in 2017. Importation price has increased from 7.9 % (INS, 2017).

Cameroon has a biggest natural potentiality good for Rice culture on all national territory according to the land, resources in water and climate. Many governmental interventions were recorded, but the lower valorization of natural resources and public interventions on this culture remains few. In research domain, Institute of Agricultural Research and Development (IRAD) multiply research activities and solutions concerning productivities of Rice. Through their international partnership (Center of Africa Rice and International Rice Research Institute). IRAD has experimented high potential technologies for improving the productivity and the quality of local Rice like NERICA (New Rice for Africa). Varieties Nerica were experimented in 1990, by crossing between Asiatic Rice (*Oryza sativa*) and African Rice (*Oryza glaberrima*). Many varieties were tested, adopted and vulgarized by IRAD through the country. In a Northern part, variety Nerica L36 is the most used and most appreciated from all. These could be justified by the adaptability of these variety on humid area to irrigated zone. Considering the few irrigated perimeters, this variety response well for the producers which are satisfied by their production in humid area and disseminated to others zone on the valley of Bénoué. However, variety NL36 has a high yield (4.5 t/ha in rural zone and with potential yield around 6 t/ha), good and

appreciable for their quality in term of gustation. These variety has short cycle compared to others traditional varieties, which is recommended for Sudano-area in a context of climate change.

In fact, for enhance yield, it is important to use improved varieties, but also recent agricultural strategies and fertilizers (Sallah *et al.,* 2009). Nowadays, agricultural practices used by the producers is endogens. However, the productivity of rice is low due to delay in nursery sowing and late transplanting, faulty methods of cultivation and little or no use of fertilizers. The secret of boosting its yields mainly lies in timely transplanting and proper fertilization the crop (Jagtap *et al.,* 2018). Also, the establishment of crop is very slow in drilling method result in low yields due to heavy weed infestation (Jagtap *et al.,* 2018). But, the introduction of news varieties not satisfy to increase the production of Rice. We could ask that if the quantity of fertilizers should be a factor for optimizing good growing of plants and yields of Rice on a humid area for the populations of rural zone. It is this context that, theses research was made in order to determine the recommended dose of fertilizers recommended for good products of Rice culture in a humid area of the valley of Benoué

## II. Materials et Methods

*a) Description of the Site*

Study was realized at the experimental site of IRAD precisely on Kismatari near to valley of Benoué situated at 15 km of North of the town of Garoua, Cameroon. One site was chosen with geographical coordinates: 09°34'310'' N and 013°27'712'' E. Climate of this locality is Sudano-Sahelean types with two seasons: a short raining season beginning from May to September and long dry season beginning from October to April.

*b) Vegetal Material*

Vegetal material used is the variety adapted to humid area of type Nerica L36. The variety experimented is Nerica L36 and their characteristics is detailed on the table 1 below:

*Table 1:* Characteristics of the Variety Nerica L36

| Denomination (synonyms) | NERICA L 36 |
|---|---|
| Pedigree | WAS 161-B-6-B-1 |
| Parent | TOG5681/4*IR64 |
| Genetic nature | Pure descendant |
| Varietal type | *Oryza sativa* x *Oryza glaberrima* |
| Years of creation | ADRAO (2007) |
| Date of introduction | 2008 |
| Responsible of maintaining | IRAD |
| Cultural vocation | Humid area, irrigated |
| Cycle (days) | 95-105 days |
| Seeds texture | long |
| Weight of 1000 seeds (g) | 30 to 40 |
| Potential yields (t/ha) | 4 to 6 t/ha |
| Others characteristics | Tolerant to dryness, good resistance to diseases and insects' good aptitude to transformation: white seeds; organoleptic characteristics: culinary quality not stick. |

*Sources: Warda (2008)*

*c) Experimental Design and Treatments Applied*

Experimental design was a split-plot with two factors: Factor 1 concerning dose of fertilizers and Factor 2 concerning variety of Rice (*Nerica* L36). Study started on July 2021, with preliminary works like clearing and treatments of experimental unit with herbicide (Momtaz (insecticide and fungicide for the seeds). The surface was 86.975 $m^2$ constituted of four treatments repeated three time. Two weeks after sowing, we proceeded to remove exceeding plants on pockets in order to have recommended density per pockets and transplanting non germinated pockets to two plants per pockets.

Density of plants is constituted of three levels for sowing: De1=20 cm x 20 cm; De2=25 cm x 25 cm; De3=30 cm x 30 cm. density used for sowing were 250.000 pockets/ha for the distance of 20 cm within lines and 20 cm among pockets of every line; 160.000 pockets/ha for the distance of 25 cm within line and 25 cm among pockets of every line and 111.111,111 pockets for the distance of 30 cm within line and 30 cm among pockets of every line. In every pocket approximatively 5 seeds were sowed.

*d) Fertilization of plants*

Uses of fertilizers are important in Rice culture because he permit good growing of plants, fructification and maturation process of panicles (padding). One type

of fertilizers (mineral) was used with formula NPKSB 14-23-14-5-1 and treatments (doses) used is constituted to different levels of doses of fertilizers: T1 (0 kg NPKSB+100 Kg Urea/ha); T2 (150 kg NPKSB+100 Kg Urea/ha); T3 (200 kg NPKSB+100 Kg Urea/ha); T4 (250 kg NPKSB+100 Kg Urea/ha).

*Table 2:* Treatments Providing to the Combination of Mineral Fertilizers Doses and Urea

| Treatments | Fertilizers types (Kg/ha) NPKSB (14-23-14-5-1) | Cover fertilizers (Kg/ha) Urea 46%N | Combination |
|---|---|---|---|
| T1 | 0 | 100 | 0kg/ha+100kg/ha urea |
| T2 | 150 | 100 | 150kg/ha+100kg/ha urea |
| T3 | 200 | 100 | 200kg/ha+100kg/ha urea |
| T4 | 250 | 100 | 250kg/ha+100kg/ha urea |

*e) Data Collection Procedure*

Data were collected on 9 plants randomly chosen in order to sample phenological, agro-morphological and yields data the development of plants. Growing parameters obtained by counting are: heading date at 80 %, maturity date, the number of tillers, the height of plant, panicles length, the number of panicles/plant. Harvest data collected is constituted: the number grains/panicles, weight of 1000 grains, potential yields.

*f) Statistical Analysis*

Statistical analysis was done with the software R commander. Values are estimated in terms of average ± standard error. Means comparison was made using t-student test and ANOVA on the probability of 5 %.

## III. Results

*a) Agromorphological Aspects*

i. *Height of Plants*

Effect of different doses per density on height of plants is presented in table 1. Comparatively within doses, dose 2, 3, 4 were significant (P≤0.05) on growth of height of plants for the three densities (1, 2, 3) considered (20 cm x 20 cm; 25 cm x 25 cm and 30 cm x 30 cm). According to different doses, the height of plants varies from 103 to 111 cm for the dose 2; 107 to 112 cm for the dose 3 and 105 to 115 cm for the dose 4. Which permit to deduce that the doses 2, 3, 4 are favorable on growing on height of plants for the three densities considered of the variety Nerica L36.

*Table 3:* Height of Plants According of Doses and the Densities

| Treatments | Height (cm) | | |
|---|---|---|---|
| | Density 1 | Density 2 | Density 3 |
| T1 | 92.67±4.51b | 102.33±7.57b | 102.67±9.71b |
| T2 | 103±2.0a | 110.33±3.51a | 111±3.60a |
| T3 | 107.67±0.57a | 115.33±2.08a | 112.33±1.53a |
| T4 | 105.33±1.15a | 110.67±2.52a | 115.33±3.51a |

*NB:* Data of the column for a variable followed by the same letter are not significantly different at the level of probability considered (P≤0.05). T1 (0 kg NPKSB+100 Kg Urea/ha); T2 (150 kg NPKSB+100 Kg Urea/ha); T3 (200 kg NPKSB+100 Kg Urea/ha); T4 (250 kg NPKSB+100 Kg Urea/ha). Density 1 (20 cm x 20 cm), Density 2 (25 cm x 25 cm), Density 3 (30 cm x 30 cm)

ii. *Number of Tillers*

Table 4 present the number of tillers for the different doses per density considered. Compared between the doses, the three doses (2, 3, 4) were significant (P≤0.05) on the number of tillers of plants for three densities (1, 2, 3) considered. Concerning the aspect dose per density, the number of tillers varied respectively of 12 to 22 for the dose 2, 14 to 21 for the dose 3 and 11 to 22 for the dose 4. We could deduce that dose 2, 3, 4 favor a good tillage of plants during growing for all the densities considered of the variety Nerica L36.

*Table 4:* Number of Tillers According to Doses and Densities

| Treatments | Number of tillers | | |
|---|---|---|---|
| | Density 1 | Density 2 | Density 3 |
| T1 | 9.33±2.08b | 14.00±1.73b | 15.67±6.1b |
| T2 | 12±2.0ab | 16.33±1.53ab | 22±1.73a |
| T3 | 14.67±1.15a | 18±1.0a | 21.33±2.08a |
| T4 | 11.67±1.15ab | 18±1.0a | 22±1.73a |

*NB:* Data of the column for a variable followed by the same letter are not significantly different at the level of probability considered (P≤0.05). T1 (0 kg NPKSB+100 Kg Urea/ha); T2 (150 kg NPKSB+100 Kg Urea/ha); T3 (200 kg NPKSB+100 Kg Urea/ha); T4 (250 kg NPKSB+100 Kg Urea/ ha). Density 1 (20 cm x 20 cm), Density 2 (25 cm x 25 cm), Density 3 (30 cm x 30 cm).

iii. *Number of panicles*

Table 5 shows the number of panicles per plants according to doses and different densities. Comparatively between the dose, the dose 2, 3, 4 were significant (P≤0.05) on the number of panicles per plants for the density 2 (25 cm x 25 cm). Considering the doses for the density 2, the number of panicles per plants varied from 16 to 18 compared to dose 1 (14). Contrary, the effect of different doses not influenced the number of panicles per plants for the density 1 and 3. However in comparison within doses, doses 2, 3, 4 increases the number of panicles per plants, deducing that the density 2 improve the number of panicles per plants of the variety Nerica L36.

*Table 5:* Number of Panicles According to Dose and Densities

| Treatments | Number of panicles/plants | | |
|---|---|---|---|
| | Density 1 | Density 2 | Density 3 |
| T1 | 11±1.0a | 14.67±1.15b | 16.33±5.51a |
| T2 | 14±0.0a | 18.33±2.88a | 19.33±0.57a |
| T3 | 13±1.0a | 16.67±0.57ab | 19.33±0.57a |
| T4 | 12±1.0a | 17±2.64ab | 18±1.73a |

*NB:* Data of the column for a variable followed by the same letter are not significantly different at the level of probability considered (P≤0.05). T1 (0 kg NPKSB+100 Kg Urea/ha); T2 (150 kg NPKSB+100 Kg Urea/ha); T3 (200 kg NPKSB+100 Kg Urea/ha); T4 (250 kg NPKSB+100 Kg Urea/ha). Density 1 (20 cm x 20 cm), Density 2 (25 cm x 25 cm), Density 3 (30 cm x 30 cm)

iv. *Length of Panicles*

Table 6, present the length of panicles for the different doses and per density. Compared among different doses, doses 2, 3, 4 were significant on length of panicles for the density 1 (20 cm x 20 cm) and 3 (30 cm x 30 cm). Effect of different doses not affect length of panicles for the density 2 (25 cm x 25 cm). However, in comparison among doses, the doses 2, 3, 4 increases the length of panicles and permit to deduce that the density 1 and 3 improves the length of panicles of the variety Nerica L36.

*Table 6:* Length of Panicles According to Doses and Densities

| Treatments | Length of panicles | | |
|---|---|---|---|
| | Density 1 | Density 2 | Density 3 |
| T1 | 23±2.64b | 26.33±2.52a | 24.33±1.53b |
| T2 | 26±1.0a | 26.67±0.57a | 26.33±1.53ab |
| T3 | 26.33±0.57a | 26.67±1.15a | 26.67±0.57ab |
| T4 | 27±1.0a | 25.67±2.31a | 28±0.0a |

*NB:* Data of the column for a variable followed by the same letter are not significantly different at the level of probability considered (P≤0.05). T1 (0 kg NPKSB+100 Kg Urea/ha); T2 (150 kg NPKSB+100 Kg Urea/ha); T3 (200 kg NPKSB+100 Kg Urea/ha); T4 (250 kg NPKSB+100 Kg Urea/ha). Density 1 (20 cm x 20 cm), Density 2 (25 cm x 25 cm), Density 3 (30 cm x 30 cm)

v. *Heading date at 80%*

Table 7 present the effect of different doses per density for sowing for the aspect of heading of plants at 80 %. Referred to different doses, the dose 1 and 2 was significant (P≤0.05) for the density 1 (20 cm x 20 cm) with the number of days varying respectively from 80 to 84 days after sowing. Followed by the dose 2 with 82 days after sowing for the density 2(25 cm x 25 cm). The dose 1 and 2 are favorable for a good heading of plants. Concerning the dose 1, the different densities considered are favorable to heading of plants, contrary for the dose 2, 3, 4, the density 1 and 3 are favorable for heading of plants of the variety L36.

*Table 7:* Heading Date at 80% According to Doses and Densities

| Treatments | Heading date at 80 % (days) | | |
|---|---|---|---|
| | Density 1 | Density 2 | Density 3 |
| T1 | 84.67±3.05a | 82.33±5.13ba | 80±2.0a |
| T2 | 80.33±3.05ab | 76.67±1.15b | 78±2.0a |
| T3 | 78±1.0c | 76.67±0.57b | 77.67±0.57a |
| T4 | 79.33±1.15bc | 77±1.0b | 79±1.73a |

*NB: Data of the column for a variable followed by the same letter are not significantly different at the level of probability considered (P≤0.05). T1 (0 kg NPKSB+100 Kg Urea/ha); T2 (150 kg NPKSB+100 Kg Urea/ha); T3 (200 kg NPKSB+100 Kg Urea/ha); T4 (250 kg NPKSB+100 Kg Urea/ha). Density 1 (20 cm x 20 cm), Density 2 (25 cm x 25 cm), Density 3 (30 cm x 30 cm)*

vi. *Maturity Date at Harvest*

Table 8 present the maturity of plants at harvest for the different doses and densities. Comparatively within doses, dose 1 was significant (P≤0.05) to the date of maturity at harvest of plants for the density 1 (20 cm x 20 cm) and 2 (25 cm x 25 cm). However, the dose 1 is favorable for the good maturation of plants of the variety Nerica L36 at harvest for the density 1 and 2.

*Table 8:* Maturity Date at Harvest According to Doses and Densities

| Treatments | Maturity date at harvest (days) | | |
|---|---|---|---|
| | Density 1 | Density 2 | Density 3 |
| T1 | 114.67±3.05a | 112.33±5.13a | 110±2.0a |
| T2 | 110.33±3.05b | 106.67±1.15b | 108±2.0a |
| T3 | 108±1.0b | 106.67±0.57b | 107.67±0.57a |
| T4 | 109.33±1.15b | 107±1.0b | 109±1.73a |

*NB:* Data of the column for a variable followed by the same letter are not significantly different at the level of probability considered (P≤0.05). T1 (0 kg NPKSB+100 Kg Urea/ha); T2 (150 kg NPKSB+100 Kg Urea/ha); T3 (200 kg NPKSB+100 Kg Urea/ha); T4 (250 kg NPKSB+100 Kg Urea/ha). Density 1 (20 cm x 20 cm), Density 2 (25 cm x 25 cm), Density 3 (30 cm x 30 cm)

*b) Yields Aspects*

i. *Seeds Number/Panicles*

Table 9 present the number of seeds per panicles according to doses and density. Comparatively within doses, the dose 2, 3, 4 were significant (P≤0.05) on number of seeds per panicles of all densities considered. According to different doses, the number of grains per panicles varies from 130 to 174 for the dose 2, 150 to 174 for the dose 3 and 161 to 186 for the dose 4. However, we could deduce that the dose 2, 3, 4 increases the number of grains per panicles for all densities considered of the variety Nerica L36.

*Table 9:* Seeds Number Per Panicles According to Doses and Densities

| Treatments | Seeds number/panicles | | |
|---|---|---|---|
| | Density 1 | Density 2 | Density 3 |
| T1 | 116.93±15.95c | 131.13±17.58b | 144.67±21.54b |
| T2 | 130.20±11.64bc | 156.67±8.95ab | 174.73±9.14a |
| T3 | 150.80±29.47ab | 151.87±8.05ab | 174.40±15.51a |
| T4 | 161.53±12.26a | 163.53±14.05a | 186.93±18.46a |

*NB:* Data of the column for a variable followed by the same letter are not significantly different at the level of probability considered (P≤0.05). T1 (0 kg NPKSB+100 Kg Urea/ha); T2 (150 kg NPKSB+100 Kg Urea/ha); T3 (200 kg NPKSB+100 Kg Urea/ha); T4 (250 kg NPKSB+100 Kg Urea/ha). Density 1 (20 cm x 20 cm), Density 2 (25 cm x 25 cm), Density 3 (30 cm x 30 cm)

ii. *Weight of 1000 Seeds*

Table 10 show the weight of 1000 gains according to doses and densities. In comparison within different doses formulated, none significant (P≤0.05) difference was recorded between the doses for all the density considered of the variety Nerica L36.

*Table 10:* Weight of 1000 Seeds According to Doses and Densities

| Treatments | Weight of 1000 seeds | | |
|---|---|---|---|
| | Density 1 | Density 2 | Density 3 |
| T1 | 26.67±0.85a | 26.77±0.50a | 26±0.88a |
| T2 | 26.43±0.51a | 26.33±0.57a | 26.70±1.0a |
| T3 | 26.33±0.35a | 26.43±0.51a | 26.67±0.35a |
| T4 | 26.10±0.17a | 27.13±0.51a | 26.77±0.68a |

*NB:* Data of the column for a variable followed by the same letter are not significantly different at the level of probability considered (P≤0.05). T1 (0 kg NPKSB+100 Kg Urea/ha); T2 (150 kg NPKSB+100 Kg Urea/ha); T3 (200 kg NPKSB+100 Kg Urea/ha); T4 (250 kg NPKSB+100 Kg Urea/ha). Density 1 (20 cm x 20 cm), Density 2 (25 cm x 25 cm), Density 3 (30 cm x 30 cm)

iii. *Potential Yields*

Table 11 present the potential yields according to doses and densities. In comparison among the different doses formulated, doses 2, 3, 4 were significant on potential yields of the variety Nerica L36 for all the densities 1, 2, 3 (20 cm x 20 cm; 25 cm x 25 cm and 30 cm x 30 cm). Which permit to deduce that the dose 2, 3, 4 increases the productivity for the three densities considered of the variety Nerica L36.

*Table 11:* Potential Yields According to Doses and Densities

| Treatments | Potential yields | | |
|---|---|---|---|
| | Density 1 | Density 2 | Density 3 |
| T1 | 3.83±0.50b | 4.53±0.81b | 4.30±1.58b |
| T2 | 6.57±1.30a | 7.50±1.08a | 5.60±0.36ab |
| T3 | 6.80±1.77a | 7.43±0.30a | 6.13±0.72a |
| T4 | 6.60±0.55a | 6.83±0.57a | 5.93±1.12ab |

*NB:* Data of the column for a variable followed by the same letter are not significantly different at the level of probability considered (P≤0.05). T1 (0 kg NPKSB+100 Kg Urea/ha); T2 (150 kg NPKSB+100 Kg Urea/ha); T3 (200 kg NPKSB+100 Kg Urea/ha); T4 (250 kg NPKSB+100 Kg Urea/ha). Density 1 (20 cm x 20 cm), Density 2 (25 cm x 25 cm), Density 3 (30 cm x 30 cm)

## IV. Discussions

Results of our study showed that within different doses formulated on field, the doses 2, 3, 4 were affect significantly (P≤0.05) height of plant Rice of the variety Nerica L36 for the three densities (1, 2, 3) considered (20 cm x 20 cm; 25 cm x 25 cm and 30 cm x 30 cm). These different doses improve the growing of plants on field and height of plants were highest with the different doses formulated. Works of Amedep et al. (2022) showed that height of plants of the variety Nerica 60 responses well to fertilization with organic manure during their growing stages. Similarly works of Moussa et al. (2021) on mineral fertilization (cereals complex and urea) of Nerica Rice variety with different doses showed a highest height of plants Rice during their growing.

Numbers of tillers for the variety Nerica L36 were significantly (P≤0.05) highest with the uses of different doses of fertilizers formulated. Tillers number were improved with the doses 2, 3, 4 for all density considered. However, tillers stages of plants were good for the three densities considered. Works of Amedep et al. (2022) showed a highest number of tillers for the variety ITA 300 during the growing of plants with the dose of organic manure. Similarly, Moussa et al. (2021) found significant growing of tillers of the variety Nerica 4 and 8 with mineral fertilizers (cereals complex and urea). In the same, works of Raholimboahangy (2015) showed that uses of different NPK treatments were significant on the number of tillers. Soils of Riziculture are mostly deficient in Nitrogen element for good growing pf plants (Raholimboahangy, 2015).

Uses different doses of NPK fertilizers increased the number of panicles of the variety Nerica L36. The doses 2, 3, 4 significantly (P≤0.05) improve number of panicles for the density 2 (25 cm x 25 cm). Works of Moussa et al. (2021) on different doses of mineral fertilizers based on cereals complex and urea showed also a significant number of panicles of plants Rice. Our study corroborates with works of Lacharme et al. (2001) and Akintayo et al. (2008), founded that use of mineral fertilizers on variety Nerica 4 and 8 favor a good density of panicles during growing.

Results of study showed that the uses of different doses of mineral fertilizers were significantly (P≤0.05) highest on the length of panicles with the doses 2, 3, 4 of the variety Nerica L36, compared within the doses for the density 1 and 3. These different doses improve the length of panicles with the density 1 and 3. Works of Nadjilom et al. (2020) showed positive responses on length of panicles of two varieties of Rice with the mycorrhized than non-mycorrhized treatments in South-Chad.

Results on heading date at 80% of plants showed that for all the doses and densities considered, the dose 1 and 2 was important for the density 1 (20 cm x 20 cm). Followed by the dose 2 with density equal to 25 cm x 25 cm. The dose 1 and 2 are considered for good heading of plants, but the dose 2, 3, 4 responses well to heading of plants with the density 1 and 3, contrary to the dose 1 which responses well for all the densities considered of the variety Nerica L36. Maturity of plants at harvest was significant for the dose 1 (20 cm x 20 cm) and 2 (25 cmx 25 cm). which permit to deduce that the dose 1 is favorable for good maturation of plants of the variety Nerica L36 at the harvest for the two densities. Contrary, works of Asmamaw (2015) showed that plants density was not affect full heading at 74 DAT and physiological maturity (104 DAT) of Rice (*Oryza sativa*).

Our results of number of seeds per panicles with uses of different doses and density showed that number of seeds per panicles were significantly (P≤0.05) highest with the dose 2, 3, 4 with all the densities. The number of seeds per panicles of the variety Nerica L36 increased for all the densities considered. Same results were made by Nadjilom et al. (2020) which showed important seeds number per panicles of two varieties of Rice with the mycorrhized than non-mycorrhized treatments in South-Chad.

Weight of 1000 seeds for the variety Nerica L36 were not significantly (P≤0.05) affected by the uses of different doses of mineral fertilizers for all density considered. Contrary, works of Dieng (2021) showed a significant effect of doses of organo-mineral on the weight of 1000 seeds of Rice.

Potential yields recorded by the uses of different dose of mineral fertilizers and densities showed that doses 2, 3, 4 were significant highest (P≤0.05) on potential yields of the variety Nerica L36 for all densities considered. These different doses increase the productivity of plants for the three densities of Nerica

L36. Same results were also found by Dieng (2021) on grains yields of Rice with uses of doses of organo-mineral on growing and yields of Rice. Works of Saidou et al. (2014) showed a significant difference among different forms of fertilizers applied concerning grains yields of the variety Rice IR841 et Nerica-L14.

## V. Conclusion

Objective of this study was to determine the doses and densities which responses well on the degraded soil of the north, especially with the variety Nerica L36 on growing and yields parameters at the experimental site of the Institute of Agricultural Research for Development (IRAD), Cameroon. Concerning growing, the doses 2, 3, 4 are recommended for increase and improve the productivity of culture for all densities considered. Study permit to conclude that densities 1, 2, 3 are good for optimizes the yield of culture of the variety Nerica L36.

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