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Research Paper

Insecticide effect on rice (*Oryza sativa* parain) on KOMBOKA and NERICA4 varieties within rice Kashusha'sfields, Eastern Democratic Republic of Congo.

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ABSTRACT*: The present study which focused on insecticide effect on rice (Oryza sativa parain) on KOMBOKA and NERICA4 varieties within rice Kashusha'sfields, Eastern Democratic Republic of Congo, which consisted of determining damage caused by rice insect pests phenological differences stages in Kashusha ecosystem.*

A split- plot designcontaining three repetitions, two varieties rice (KOMBOKA and NERICA4) and two treatments was adopted. Insecticide treatments were carried out between 6:30 a.m. and 8:30 a.m. on stages different at 65th, 90th and 120th days after transplantation. The cypermethrin spraying method was applied to each variety each subplot expect control.

After panicle harvesting, the different productions by variety and treatment led us to estimate the yieldloss due to insect pests on KOMBOKA and NERICA4 to Kashusha's rice fields. The results obtained proved that the loss there was more than 85% to rice plants.

KEYWORDS*: Rice, Loss, Insecticide, Kashusha.*

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I. Introduction

Rice (*Oryza Sativa*parain) is the staple of more than half of the world's population. Global demand for rice should go from 676 million tonnes in 2010 to 763 million tonnes in 2030 tonnes [1]. Cultivated rice is from South and Southeast Asia, it belongs to the Poaceae family. There are two cultivated species and 21 wild species of the genus *Oryza*. *Oryza Sativa* is cultivated rice in Asia and all over the world [2].

In the Democratic Republic of Congo (DRC), rice is the second most consumed cereal after corn. The estimated consumption of white rice varies from 7 kg to 19.5 kg/person/year [3-4]. Rice is struck by multiple constraints, in particular certain pathologies and pest insects [1].

In the sense of controlling insects of pests on rice cultivation, several protection methods can be used, among which we have: culture, biological, genetic, physical, integrated and chemical fight [5].

Damages caused by roders of stems are a threat to rice production, drill damage, in particular dead hearts and white panicles constitute a major loss [6- 7-8].

The main damage is observed by fruit perforations and the fall of flowers [10]. In rice lockers, insects sew a large loss evaluated at more than 80% yield on rice culture [9-7-10]. The use of insecticides is a good method of managing rice plants in rice lockers [1- 11]

II. Materials and methods

2.1. Location

The ecological conditions during the test were determined by the GPS and the thermometer, thus, the altitude was 1535 m, a latitude of 2 ° 19 "55 'and a longitude of 28 ° 48" 7' with average temperatures 16 and 20 ° C. The plots had a soil holding water not containing trees and pebbles.

2.2. Equipment

This study, biological materials were the rice plants of two varieties (KOMBOKA and NERICA4) in place in Kashusha lockers in Kabare territory in South Kivu.

During the delimitation of blocks, the machetes was used to cut and cut the picking stakes. A decameter of 100 meters in length to us to determine the dimensions of the experimental space of each plot and variety. The board labels were used to identify the blocks, treatment and names of each variety.

The houes were our equipment to plow, plan rice lockers and the formation of the diguettes.

The chevron to levol the rice lockers at the same levels for good water management and allow good adhesion of the seedlings in their poquets according to ficels to orient the lines during transplanting.

The markers used to mention the processing codes, plots and blocks on the labels.

Insecticide (cypermethrin) contained in a back sprayer with the capacity of 2o liters to control insect pests of rice according to their phenological phases, hence the 10cc syringe had the role of quantifying the product (cypermethrin) to mix In water to obtain a solution to be sprayed at rice plants.

During the harvest, the expensive helped to harvest the panicles of the rice according to the size of the plant carrying them before in the package in the bag to transport them to the deposit, they were dried on the bush for 6 hours of time for 4 days on solar rays For its detachment by 120cm sticks/sticks. To separate the rice balls from the paddy rice; The vans intervened to valor the rice grains, wrap them in the bags containing the duplicating paper stretches to contain the raw data of each variety and processing then weighed with the precision balance to estimate the loss of the yield. All bags containing Paddy rice were tied up by the strings and kept at the deposit for the next search.

2.3. Experimental disign

Simmitted by the decameter, an experimental device in Split-Plot, it consisted in the allocation of treatments to experimental units by reasoned randomization.

The experimental system consisted of three (3) blocks divided into elementary plots of 10x10m. Each block had two types of treatments (insecticide and witness) were applied on two varieties of rice (KOMBOKA and NERICA4) with three repetitions (4 X 3 -block treatments which give 12 plots). The elementary plots were separated from the 2 m alleys and the blocks were by the 4 m alleys.

The plots had a soil holding water not containing trees and pebbles.

The preparation of the nurseries began with mowing, plowing and delimited. 2 bedseeds of 1 meter width x 4 lengths were installed hence each variety occupied 1m x 4m. The Germition plantled was installed on January 26 until February 15, 2021.

The plowing was made by the hoe, the leveling by the chevron 10 cm thick and 3 meters in length and supported by three people to level rice cassies.

Seeds two varieties: NERICA4 and KOMBOKA were soaked in fresh water for 48 hours to stimulate germination. The stay of seedlings in nursery was 21 days for transplanting.

The transplanting was done in the plots of 100m to the differences of 25 C m x 25Cmentre the lines and on the lines /picquets (25 cm x 25 cm) for each variety and 50 cm of separation between the two varieties /under 2 plant plot per poquet.

The irrigation mode was surface irrigation or water is brought to crops in plots by controlled irrigation channels. The water levol was 10cm high upon transplantation, quantified to 5 cm to floweringand turn off to grainshardening.

2.4. Phytosanitary treatment

Phytosanitary treatment began 65th, 90 and 120th days after sowing (Talling, Epiaison/Flowering and Maturity) for an insecticide known in the name of cypermethrin. 10cc cypermethrin were defined quantitywithin 20 liters of water in a sprayer on the back for each 100m (10m²) depending on these different phenological stages.

2.5. Weeding

The first weeding was made by hand 1 month after transplanting and the second at 60th days.

2.6. Harvest

The rice was harvested when grainshave 100% upper part of the panicles changed green color in yellow-pale.

The harvested panicles have been dried, beaten, valid, weighed, wrapped and classified by variety. Each useful plot of 9m/9m has been harvested to estimate theyield loss.

It was carried out by cutting the tufts about 50 cm for NERIKA4 and 90 for KOMBOKA compared to its collar. The harvested panicles were brought to the deposit for:
drying ; The harvested panicles were exposed to the solar department for 4 days for its slaughter;
Slaughter; The panicles were shot down on the bush by means of 120 cm sticks for them,
Vanning; Paddy rice were valued by vans to separate other particles, wrapped in bags to estimate the yield of each plot/treatment to determine theyield loss by precision balance,
The precision balance allowed us to specify the so-called loss of pest insects in the Kashusha rice lockers.
Estimate yield loss.
The yieldloss linked to pest insects for the treated and untreated plots was obtained by the following formula:

$$P = \frac{\text{average yield T1} - \text{average yield T2 x 100}}{\text{average yield T1}} (1)$$

Legend
T1 = treated plot
T2 = untreated plot (witness)
P = loss of yield.

2. 7. Statistical data analysis

The data were encoded by Microsoft Excel 2010. The results linked to the various average productions by processing were subject to the Chi squareindependence tests among two variables and adequacy, multiple component analysis (ACM) and factory analysis Mixed data (AFDM) at 0.05 threshold thanks to R version 10 software.

III. RESULTS AND DISCUSSION

To estimate the damage due to insect pests, the results related to the average yield are recorded in Table 1 below.

3.1. Evaluation lossesyield

Table 1 below presents the average yields obtained on the two varieties of rice in the witness plots and the plots treated with cypermethrin.

Table 1. Average yield by treatment

Replication	yield (Kg/ha)			
	KOMBOKA-1	**KOMBOKA -2**	**NERICA4- 1**	**NERICA4- 2**
1	4360,2	348,90	3192	352,1
2	4162,8	334,19	3409,2	349
3	4156	345,2	3470,45	333,9
Mean	4226,333	339,695	3357,216	345
Losses yield	**91,96**		**89,7**	

Legend
-KOMBOKA-1: KOMBOKA variety treated with insecticide (Cypermethrin),
-KOMBOKA-2: control variety,
-NERICA-1: NERICA4 variety treated with insecticide (Cypermethrin),
-NERICA-2: NERICA4 control Variety.

The results recorded in Table 1 above show the superiority of yields for the plots dealt with in all blocks compared to those untreated with the insecticide. Indeed, yield losses following pest insects were raised to the KOMBAOKA variety (91.96%) against 89.7% ofloss with NERICA4 variety.

Overall yield losses to these two varieties were very high >85%. This situation was explained by the damage of pest insects on the two varieties when no insecticide application was not made. The Chi square test with 95% confidence threshold confirmed that both varieties were attacked with the same percentages. To estimate the loss of yield, we took into account the total average of insecticide treatment (T1) minus the average of the witness plot (T2) x 100 on total average of the treated plot (T1). We note that all treated plots have produced more than untreated plots (witness). We estimated approximately (91.96%) for KOMBOKA and 89.7% case of NERICA4 of the loss linked to pest insects before moving on to statistical analyzes to allow us to make the decision by the Chi square of adequacy.

3.2. The variance between treatments and varieties

Table 5. The yieldLoss

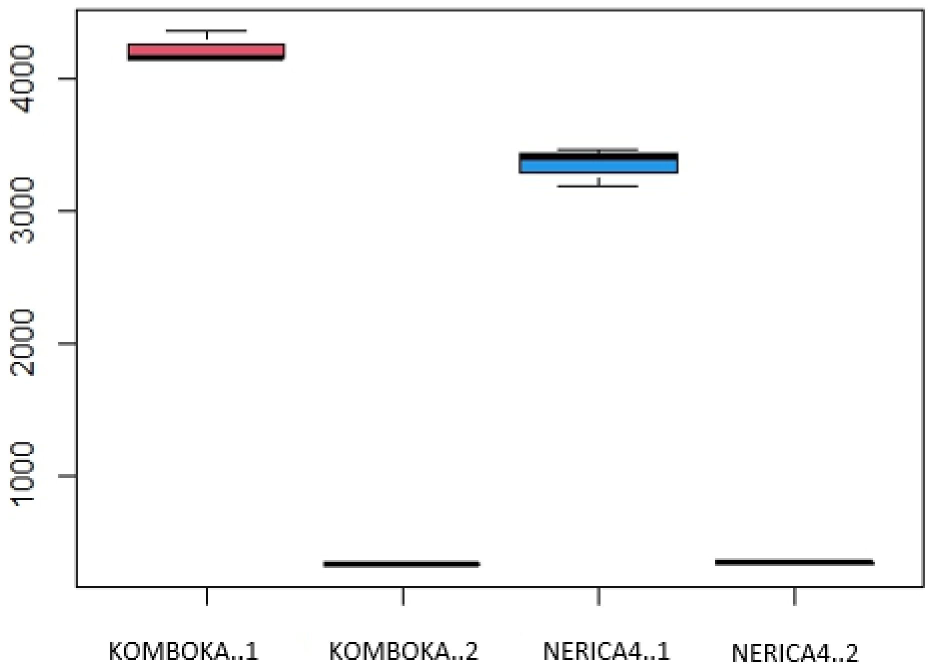
Yield loss (%)		**Chi square**	**df**	**p-value**	**Signification**
KOMBOKA	NERICA4	0,028116	1	0,8668	**NS**
91,96	89,7				

Legend
-KOMBOKA-1: KOMBOKA variety treated with insecticide (Cypermethrin),
-KOMBOKA-2: Control variety,
-NERICA-1: NERICA4 variety treated with insecticide (Cypermethrin),
-NERICA-2: NERICA4 control Variety.

With regard to the value of Chi square (0.028116) to the DF (1) and P-Value (0.8668), on the threshold of 0.05% the variety KOMBOKA and the NERICA4 variety are attacked in the same way.

3.3. Yield analysis and interpretation

The figure below shows that the yield average of the KOMBOKA-1 variety is 4226.333kg/ha, from KOMBOKA-2 of 339.695 kg/ha, from NERICA4-1 of 3357.216kg/ha and NERICA4-2 345 kg/ha (Figure 9).



IV. Discussion

We have observed that the damage caused by pest insects was enormous in our rice lockers, we observed different damage caused by certain rod forest insects which were present in the form of larva in the interior of the leafy sheaths. The larva fed on leaf sheaths. They dig inside the stems to eat with the whole stem starting with the apical rod which announced the total damage. The witness plots were more attacked than the plots treated with the Tallage, the Epiaison/Flowering and Maturity. The damage caused by pest insects was enormous (90%) in rice lockers. The damage caused by Dipteres and Lepidoptera impact phases whose vegetative phase (dead hearts and galls), the reproductive phase (white panicles) [12]. So, this result corroborates with information testifying that there is Many pest insects which seriously damage rice cultivation up to a loss of yield between 80%- 90% [9- 13- 14- 15].

Also, it was found that the plots treated with cypermethrin gave a high yield that the witness plots (untreated to cypermethrin). Our results are similar to those [16-14 -17-18] which report that the treatment is carried out in the third week for the reduction of dynamics of pest insects and that without chemical treatment, production drops because of insects Pests for rice farmers and other plants.

All the plots treated with cypermethrin have produced more than untreated plots. A loss of 91.96% was recorded on the KOMBOKA variety and a loss of 89.7% on the NERICA4 variety. Cypermethrin had a positive impact for the production of these two varieties. These results are similar to the results of [19-20] which emphasize that the effectiveness of fungicides is a good method of fighting for agricultural income which would be a good method of controlling the dynamics of pests of rice culture.

V. Conclusion

Our study which focuses on the insecticide effect (Cypermethrin) on the damage associated with insects pests of rice/case of the KOMBOKA and NERICA4 varieties in the rice lockers of Kashusha/Kabare/Democratic Republic of Congo, had the objective of evaluate the yield losses linked to the damage caused by rice pest insects. To carry out this work, we used the phytosanitary treatment method at the insecticide (Cypermethrin) from 65th days after sowing (Talling), 90th days and maturity (120th days). 10cc were the dose defined in 20 liters of water in a sprayer for each 100m (10m²) according to their phenological phases. The data obtained made it possible to note that the efficiency losses associated with the damage caused by the pest insects on rice are evaluated at maturity (harvest) at (91.96%) for KOMBOKA and 89.7% for the NERICA4 variety.

Overall yield losses to these two varieties were very high >85%. This situation was explained by the damage of pest insects on the two varieties when no insecticide application was not made. The Chi squaretest with 95% confidence threshold confirmed that both varieties were attacked in the same percentage. We suggest that the insecticide application is carried out to reduce the damage related to pest insects and maximize production.

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References

[1]. Moinina A., M. Boulif, R. Lahlali, “The culture of rice (Oryza Sativa) and its Main phytosanitary problems: a bet ”, Mar. SCI. Agron. Vet Journal. 6 (4). 544-557_ 2018.

[2]. Alain A., Nour A. and Jean-Yves J. 2015. "Rice, rice field, rice farming" www.academia.edu/.

[3]. Orou welcome Sabi Yo, Nasser Mohamed Baco, Innocent Adédédji Labiyi, Fabien C Hountondji, Jacob Afouda Yabi, Géry Van Nieuwenhuysen and Honorat Emongou, “ Environmental effects and production of new energetic sources of biomass Coming from rice: case of rice study in Cepea Sourou in the northwest of Benin, " International Journal of Applied Research. 6 (3). 309-316_ 2020.

[4]. FIDA, WFP, Analysis of food loss: causes and solutions -Case study on the Corn and rice in the Democratic Republic of Congo, 2019. www.fao.org/economic/esa. [Accented in March 05, 2023]

[5]. Heinrichs E., and Alberto T, Barrion, Barrion, Rice-Feeding Insects and Selected Natural Enemies in West Africa, 204. https://digitalcommons.unl.edu/entomologyother. [Accented in April 22, 2021].

[6]. Togola, 2013, “peasant knowledge of rice rice rice insects and their damage In different ecological areas of Benin (West Africa) ”, Researchgate Journal. CAH Agric.19 (4). 262-266_2013.

[7]. Paul O. O., Thaddée G., Daniel O. M., Drice M. K. & Claire K, 2014, “Study of the dynamics of insect populations on the cultivation of Nerica rice in the conditions of Masuku ”, south-eastern Gabon (Franceville). International Journal of Biological and Chemical Science. 8 (1). 218-236_2013.

[8]. Silvie, p.2013, “Limits of BT rice in the entomological context of rice farming in Sub-Saharan Africa and Madagascar (bibliographic synthesis) ”, Biotechnol. Agron. SOC. Approximately. Journal. Flight. 17 (2). 407-415_2013.

[9]. Spid, practical guide for integrated production management Irrigate rice, Mali, GCP/RAF/453/SPA. 2011. [online]: www.fao.org. [Access July, 11, 2023].

[10]. M. S. -W. Ouali N’Goran, M. -F. N. KOUADIO, A. M. C.N’GUETTIA, N. L. Yeboue, Y. Tano, 2019, “Effects of phytosanitary practices on Entomofauna and yield of cucumber cucumis sativus (cucurbitaceae) linnaeus, 1753 in peasant environment In Bonoua (south-east of Côte d'Ivoire ”, Ajol-File-Journal. 31 (1). 199-212_2019.

[11]. FAO. Integrated fight against pest insects. [Online] Findable www.fao.org. [Access September, 06, 2023].

[12]. Abdoul, G., Sanou, Konan, D., Ibrahima, o. & Dona, D. problematic of implementation of the intensive rice farming system in the irrigated rice perimeters of Karfiguéla and the Kou valley in Burkina Faso. International Journal of Biologiacal AND CHEMISTRY Sciences. 10 (6). 2693-2709_2016.

[13]. BRAB. Inventory and dynamic of insects of sesame crops (Sesamum Indicum L. http://www.inrab.org. [Access September, 14, 2023].

[14]. Badiane, D., & Gueye, M. T. 2016, “Integrated management of the main pests of Cotton in Senegal and West Africa ”, International Journal of Biological and Chemical Sciences, February. 9 (5). 1-3_2016.

[15]. Houadakpod, D. Valorization of aromatic plants in the integrated management of Main insects of the Grande Morelle in South Benin: Case of Ocimum Gratissimum and O. Basilicum. Benin, 69p. 2018.

[16]. Akinsola E., Agyen - Sampong M, “The Ecology, Bionomics and Control of Rice Stem -Borer in West Africa ”, International Journal of Tropical Insect Science. 5 (2).69 - 77_2014.

[17]. Sanou, G, Dakouo, D. & Ouedraogo, I.). African ag. Intensive rice cultivation system (SRI) on attacks by the main insects depredateurs In Karfiguela and Kou Vallee irrigoles rice perimeters in Burkina Faso. African Agronomy Journal. 29 (2) - 125 -136 _2017.

[18]. Isabu. Billitin de la Rechervhe Agronomic: upstream of agriculture and elevation In Burundi [online] Findable: www.isabu-bi.org [Access September, 09,2023].
[19]. Ngamo, L. & Hance, T. diversity of pests of alternative foodstuffs and methods of struggle in tropical environment. Research Gate Journal. 25 (4) -215-220_2007.
[20]. Boulif, R. Lahlali. Rice culture (Oryza Sativa) and its main Phytosanitary problems: a bet ", Mar. SCI. Agron. Vét Journal.6 (4)-544-557_ 2018.