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Assessing the Impact of New Rice for Africa (NERICA) in the Management of African Rice Gall Midge (*Orseolia oryzivora,* Harris and Gagné) in Nigeria

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Introduction

Rice is one of the staple food crops in Nigeria and is grown in almost all the Nigerian ecologies. One major causes of low yield of rice in Nigeria is depredation by insect pests. Of all the insect pests of rice in Nigeria, African rice gall midge (AfRGM) is the most severe insect pest of lowland/irrigated rice in the recent years. Host plant resistance has been used effectively in the management of related gall midge in Asia. However, screening has shown that most of the genotypes we grow in Africa, *Oryza sativa* that are from Asia, that are resistance to Asian rice gall midge are susceptible to African rice gall midge, and that Tropical *Oryza glaberrima* (TOG) of African origin that are resistance to African rice gall midge are of low quality. Therefore hybridization to combine the useful traits of both cultivated rice genotypes to resist most biotic stresses has given rise to interspecific lines, New Rice for Africa (NERICA). NERICA is still new in Nigeria and therefore needs to be assessed in relation to its performance in yield and biotic stresses.
The objectives of this study therefore were to evaluate the impact of NERICA both in the field and screen house in the management of African rice gall midge.

Materials and Methods

Field evaluations of the impact of NERICA in the management of AfRGM were conducted at two AfRGM endemic eco-sites (Ogidiga South east Nigeria and Edozhigi North central Nigeria) for two successive seasons, 2009 and 2010 in Nigeria under rain fed conditions. Twenty-seven rice varieties collected from Africa Rice Center, IITA Ibadan were used for the experiments. The varieties include; 9 *O. sativa* (AGHANI, BW 348-1, CISADANE, ITA 306, JUMOBOR MANO, M BAHANI, TOS 14519, TOS 8091 and T1477); 9 *O. glaberrima* (TOG 5314, TOG 6270, TOG 6309, TOG 6346, TOG 7106, TOG 7206, TOG 7442, TOG 9066 and TOG5882) and 9 NERICA lines (WAS 127-IDSA-12-WAS-11-3-1, WAS 186-B-8-B-WAB-1-WAS-1, WAS-186-B--8-B-1-WAB-3, WAS127-IDSA-2-WAS-1-1-1, WAS127-IDSA-2-WAS-11-3-2, WAS186-B-8- B-WAB-1-WAS-2, WAS186-B-8-1-WAS2-WAS-1, WAS186-B-8-B-1-WAB-1-WAS-4 and WAS186-B-8-B-1-WAB-1-WAS-5). The fields were laid out in factorial experiments in RCBD with three replications. Samples for AfRGM infestation were

collected at 42 and 63 DAT at both locations. For each field sampling, 50 plants were randomly selected from each variety to assess the rate of damage by AfRGM (% tiller infestation). All screen house evaluations were conducted at Africa Rice Center, IITA Ibadan. At harvest, data were collected on grain yield. All collected data were subjected to analysis of variance (ANOVA), and rice varieties were categorized based on Standard Evaluation System for rice against AfRGM (IRRI, 2002).

Results and Discussion

The results showed significance differences in AfRGM damage between rice genotypes both within and across the locations (Figs. 1 and 2). The different levels of infestations observed among the varieties showed that different rice varieties response differently to rice gall midge attack. This is in line with Williams *et al.* (2001), Nwilene *et al*. (2002) and Omoloye *et al.* (2007). Amongst the genotypes assessed, the TOG lines showed highest level of resistant to *O. oryzivora* followed by the NERICA lines and then the *O. sativa* lines that were virtually susceptible AfRGM attack. This confirms the founding of Nwilene *et al.* (2002). According to them the TOG lines showed the highest level of resistance to AfRGM among the rice varieties assessed in Nigeria. The reduction in percentage tiller infestation recorded amongst the NERICA lines compare to the *O. sativa* lines used indicated that NERICA has significant impact in the management of AfRGM. The same trend was observed in the screen house experiments (Fig. 3). Among the various rice varieties used in the study in the two locations, the incidence of gall midge was maximum at Edozhigi. This is in line with WARDA (2000), which stated that multi location trials in four countries have shown that varietal reactions to *O. oryzivora* are highly location specific and this has tremendous implications for *O. oryzivora* resistance screening and breeding.

In terms of grain yield, the NERICA has additional advantage of higher grain yield than both *O. sativa* and *O. glaberrima* used (Fig. 4).

Conclusion

The percentage infestation and grain yields were dependent on rice varieties and were positively correlated. On the bases of improved resistance to AfRGM infestation and higher grain yield, it could be concluded that NERICA could enhance food security and improve livelihoods in Africa.

. Therefore hybridization that leads to NERICA species must be pre-eminent in any IPM package developed for AfRGM in Nigeria since it enhances resistance and increased grain yields. Most importantly, smallholder farmers may have no difficulty adopting this technology, since it is economical, environmentally sound and easy to practice instead of using expensive and dangerous chemicals in the management of AfRGM.

References

Africe Rice Center (AfricaRice) 2000. Annual reports.

Int. Rice Res. Inst. (IRRI) 2002. *Standsard Evaluation System for Rice*, Int. Rice Res. Inst. Los Banos, Philippines. Pp71.

Nwilene, F. E., C. T.Williams, M. N. Ukwungwu, D. Dakouo, S. Nacro A. Hamadoun, S.I.Kamara, O. Okhidievbie, F.J. Abamu and A. Adam 2002. Reactions of differential

rice genotypes to African rice gall midge in West Africa. *International Journal of Pest Management* 48.3: 195- 201.

Omoloye A. A. and S. Vidal, 2007. Abundance of 24-methylenecholesterol in traditional African rice as an indicator of resistance to the African rice gall mdge, *O. oryzivora* Harris and Gagne. *Ent. Sci.* 10: 249 – 2557.

Williams C. T., M. N. Ukwungwu, B. N. Singh, and O. Okhidievbie 2001. Assessment of host plant resistance in *Oryza sativa* to the African rice gall midge, with a description of a new method for screening under artificial infestation. *J. Appl. Ent*. 125, 341-349.

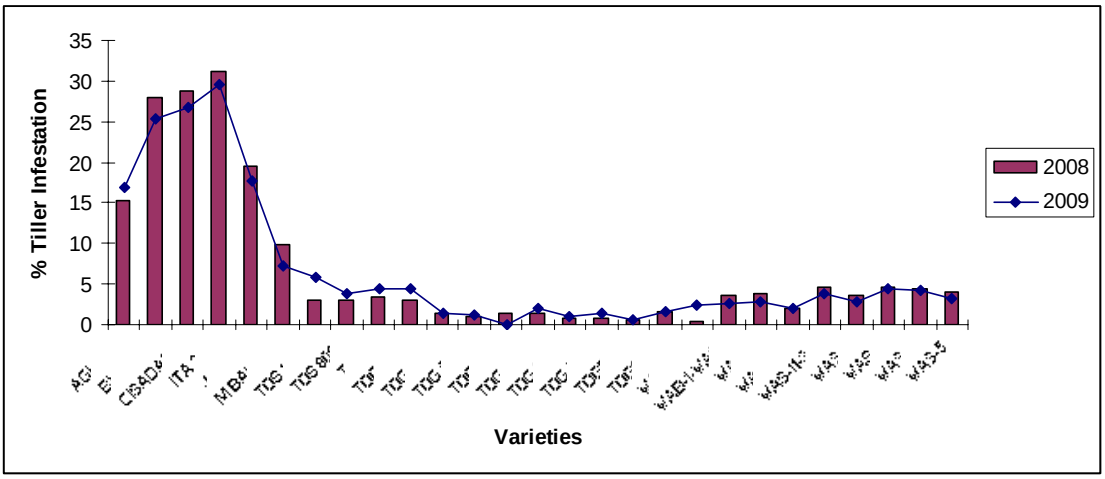

Fig 1: Percentage tiller infestation of rice varieties by *Orseolia oryzivora* at Ogidiga at 63 DAT for 2009/10 farming seasons

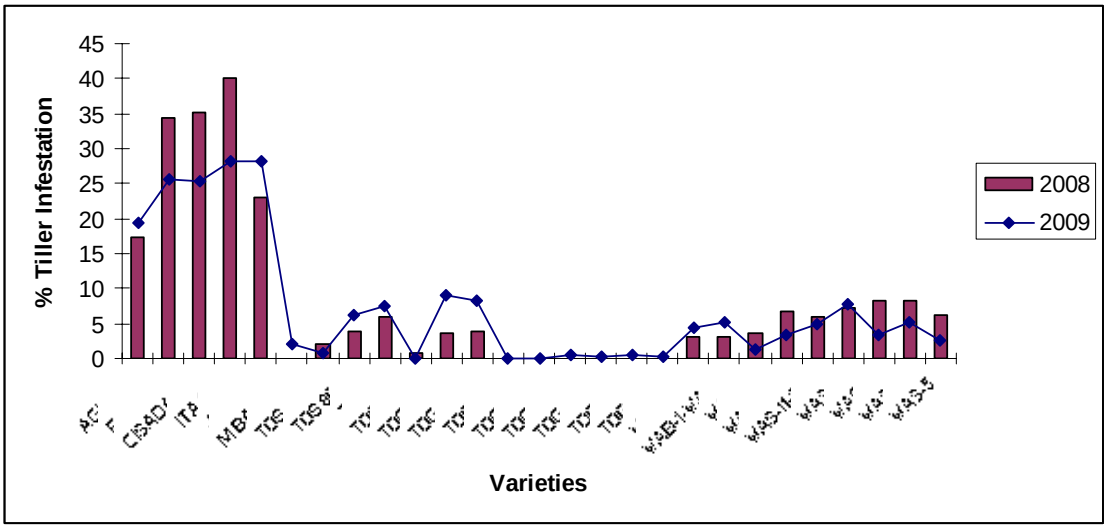

Fig 2: Percentage tiller infestation of rice varieties by *Orseolia oryzivora* at Edozhigi at 63 DAT for 2009/10 farming seasons

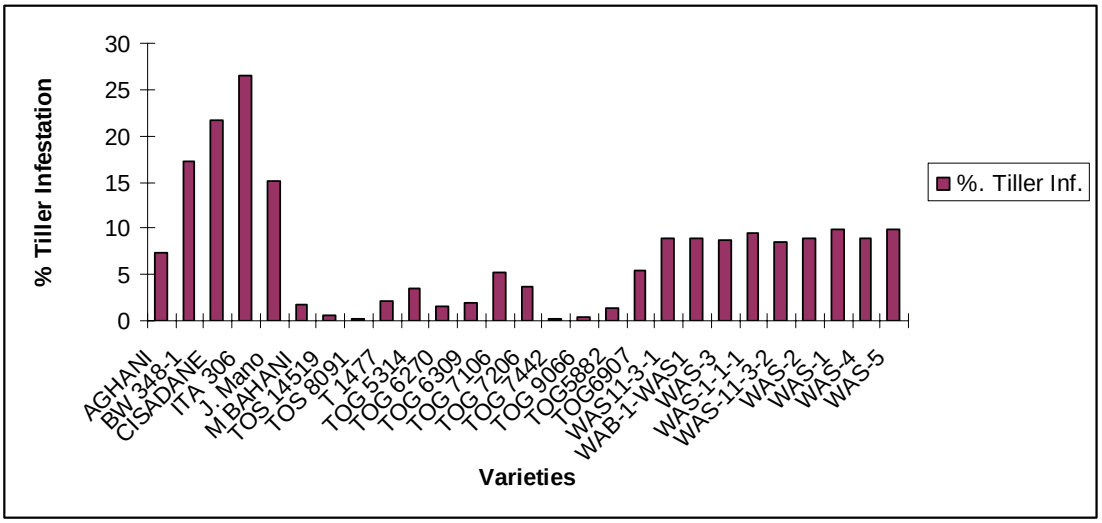

Fig 3: Percentage tiller infestation of the rice varieties by *Orseolia oryzivora* in the screen house.

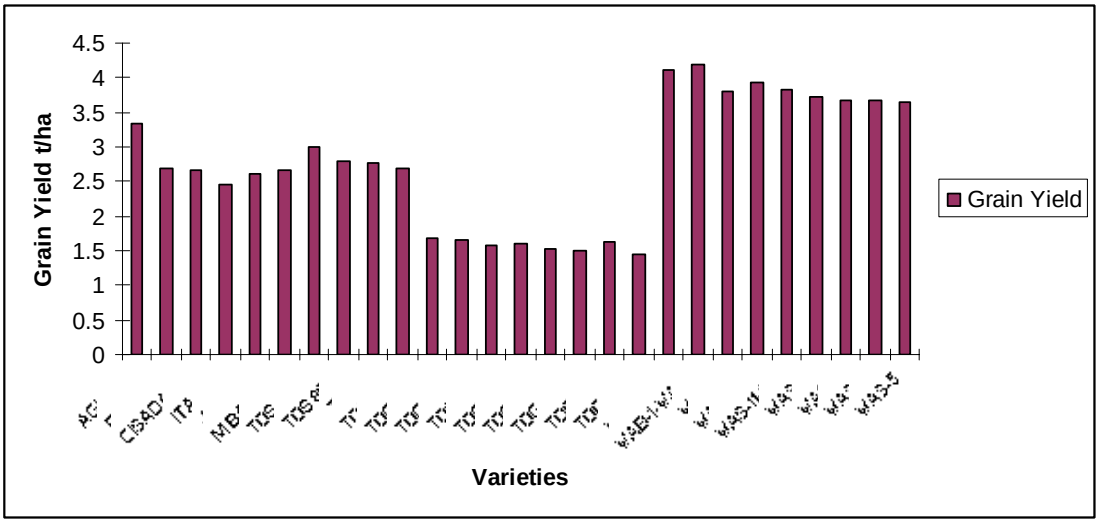

Fig 4: Total grain yield in relation to the rice varieties