NOTAS CIENTÍFICAS

RELATIONSHIP BETWEEN POTASSIUM FERTILIZATION AND PANICLE BLAST SEVERITY IN UPLAND RICE[1]

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ABSTRACT - The influence of K_2O (0, 40, 80, 120 kg ha^{-1}) at varying rates of N application (0, 30, 60 kg ha^{-1}) at planting, on panicle blast (*Pyricularia grisea* (Cooke) Sacc.) was studied in a field experiment conducted during three consecutive years with the upland rice cultivar Douradão. Panicle blast severity decreased with increasing rates of potassium in the absence of nitrogen (N0). The relationship between panicle blast and K rates was quadratic at 30 kg ha^{-1} of nitrogen. Significant response to K fertilization was not obtained at 60 kg ha^{-1} of nitrogen in relation to panicle blast severity.

RELAÇÃO ENTRE ADUBAÇÃO POTÁSSICA E SEVERIDADE DE BRUSONE NAS PANÍCULAS EM ARROZ DE SEQUEIRO

RESUMO - Estudou-se a influência da adubação potássica (0, 40, 80, 120 kg ha^{-1} de K_2O) e da adubação nitrogenada (0, 30, 60 kg ha^{-1}) no plantio sobre a ocorrência de brusone (*Pyricularia grisea* (Cooke) Sacc.) nas panículas de arroz de sequeiro, em um experimento de campo realizado durante três anos consecutivos, utilizando a cultivar Douradão. A severidade de brusone nas panículas diminuiu com o aumento das doses de potássio quando não se adubou com nitrogênio (N0). A relação entre brusone nas panículas e doses de K_2O foi quadrática na dose de 30 kg ha^{-1} de nitrogênio. Não houve resposta significativa à adubação com potássio em relação à severidade de brusone na dose de 60 kg ha^{-1} de nitrogênio.

Rice blast caused by *Pyricularia grisea* (Cooke) Sacc. is a major yield constraint in upland rice in Brazil. The pathosystem is divided into leaf and panicle blast subsystems (Teng et al., 1991). Although both leaf and panicle blast affect grain yield, losses are greater due to panicle blast during grain formation in susceptible rice cultivars (Prabhu et al., 1986).

The success of blast disease management program depends upon the availability of accurate and precise information on quantitative relationships between major nutrients and disease severity and grain yield.

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The literature on the effect of mineral nutrition on disease development, including rice blast, was extensively reviewed (Huber, 1980; Fageria et al., 1991; Zambolim & Ventura, 1993; Datnoff, 1994). The results are, however, applicable to the edaphic conditions under which the experiments were conducted.

The influence of major elements N, P and K on rice blast has been studied mostly in irrigated ecosystems and there is very little information on upland rice in “cerrado” soils. In Brazil, both leaf and panicle blast severities in upland rice have been reported to increase with increase in the rates of N and reduce grain yield when applied all at planting (Faria et al., 1982).

The split application of N in upland rice decreased blast as compared to a single application in furrow at planting (Santos et al., 1986). Panicle blast was not consistently reduced by timing and splitting of N applications (Kurschner et al., 1992). However, the results on the effect of K fertilization on blast incidence and development were conflicting. Studies conducted in Japan have shown that the correction of soil with potassium fertilization may increase, decrease or have very little effect on rice blast depending upon the nitrogen rate (Kozaka, 1965).

In a blast nursery experiment, Soave et al. (1977) have shown that both N and K increase the percentage of leaves with blast lesions.

Because the critical factor affecting blast development is high K:N ratio (Ou, 1985) the present study was conducted to quantify the relationship between K_2O and panicle blast severity at three different nitrogen rates.

A field trial was conducted in 1993/94, 1994/95 and 1995/96 rice growing seasons in Embrapa-Centro Nacional de Pesquisa de Arroz e Feijão, Goiânia, Brazil, with upland rice cultivar Douradão, which is highly susceptible to panicle blast. A randomized complete block design with three replications in the first year and four in the succeeding years was utilized. The soil was a Dark Red Latosol (oxisol) and had the following chemical characteristics before the application of fertilizers: pH in H_20 (1:25) = 5.4; extractable P = 5.8 ppm; K = 83 meq/100 mL; $Ca^{+2} + Mg^{+2}$ = 3.4 meq/100 mL.

Treatments consisted of 3x4 complete factorial of N and K_2O rates applied to the soil all at planting. Nitrogen rates were 0, 30, 60 kg ha^{-1} while K_2O rates were 0, 40, 80, and 120 kg ha^{-1}. All plots were fertilized with 90 kg ha^{-1} of P_2O_5 and 20 kg ha^{-1} of zinc sulphate. Each plot consisted of eight rows 5.0 m long. Seeds were drilled with 0.4 m row spacing and 80 seeds per meter. Panicle blast severity was assessed in the two central rows 10 days before heading according to a 6-grade scale (0, 5, 25, 50, 75, and 100% infected spikelets/panicle). Combined analysis of the three year data on panicle blast severity was utilized for the regression analysis to study the response of K_2O at different rates of N fertilization.

Potassium fertilization in the absence of N greatly affected panicle blast development, the response being significantly linear and negative with increasing levels of K_2O (Fig. 1). On the other hand, the response of panicle blast to varying rates of potassium was quadratic at 30 kg ha^{-1} (Fig. 1). Disease severity increased as the rate increased from 0 to 60 kg ha^{-1} of K_2O, over and above which it decreased with increase in the rates of K_2O, indicating

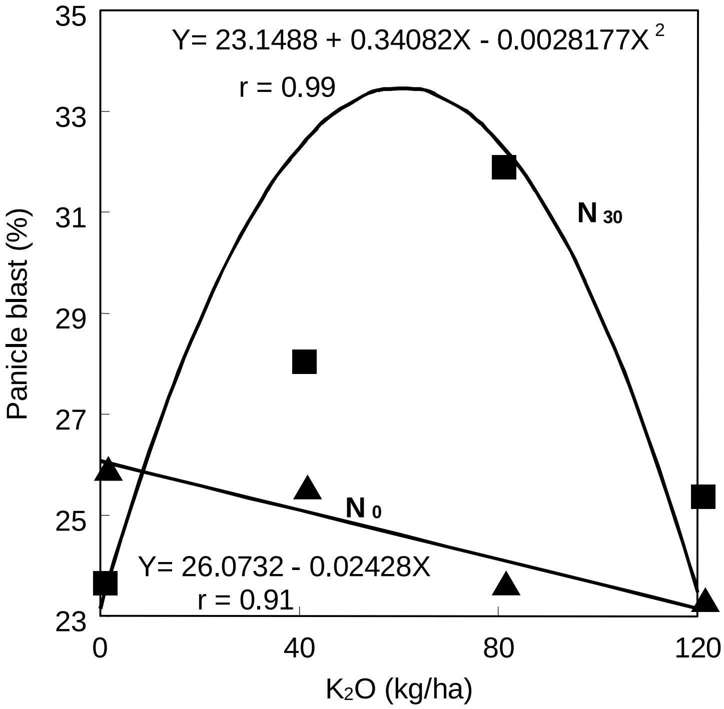

FIG. 1. Effect of potassium fertilization on panicle blast severity at two nitrogen levels in upland rice (N_0 : ▲; N_{30} : ■).

that the effect of K_2O in increasing the blast severity depends upon the rates of N fertilization. Furthermore, the results suggest that the K:N ratio is more important than the effect of each nutrient in the panicle blast development. There was, however, no response to K fertilization at N60 in relation to blast. The mean panicle blast severities were 29.2%, 27.2% and 26.5% at N60, N30 and N0, respectively.

These results agree with earlier reports (Tsuchia (1941), Chiba &Yamashita (1957) and Okomoto (1958), cited by Kozaka (1965)), which show that large quantities of potassium fertilizer cause more severe blast under high nitrogen supply. It is concluded that under soil conditions, in which K is not a limiting factor, potassium fertilizer rates up to 60 kg ha^{-1} can increase panicle blast severity depending upon the quantity of nitrogen applied.

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