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INTERCROPPING POTATO (SOLANUM SPP.) WITH MAIZE IN WARM CLIMATES

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(La culture associée Pomme-De-Terre (Solanum spp) et Maïs en climat chaud)

SUMMARY

High soil temperature late in the crop season can lead to reductions in tuber yield ; therefore a series of experiments were run in which maize and potato were simultaneously planted at three warm sites (20/30°C average night/day temperatures) in Peru. The adjacent maize crop (ranging from 10-25 per cent of normal population) provided sparse shade in the season, which resulted in reduced soil temperatures. Yield of the intercropped potato (75-90 per cent of normal population) did not generally differ significantly from that the sole crop. However, maize grain yields were proportionnately greater than expected from their respective planting densities, hence land equivalent ratios exceeded unity. Percent dry matter in tubers was improved in the intercrop whereas insect damage to tubers and foliage was diminished. The results are discussed in view of the increased light use efficiency by potato when grown adjacent to maize.

RESUME

Les fortes températures à la fin de la culture peuvent conduire à des réductions de récolte de pommes de terre. On a donc conduit une série d'expériences dans lesquelles Maïs et Pommes de terre étaient plantés ensemble dans trois situations chaudes du Pérou (températures nuit-jour 20° - 30° en moyenne). Les plants de Maïs, répartis à raison de 10 à 25 pour cent de la densité normale fournissaient une ombre légère en fin de saison, avec pour conséquence une réduction de la température du sol. Les rendements des Pommes de terre, plantées à 75 à 90 pour cent de la densité normale n'ont pas en général différé significativement de ceux obtenus en culture homogène, et les rendements en Maïs ont été supérieurs à ce qu'on aurait pu attendre en fonction des densités, donc le rendement proportionnel en culture associée a

dépassé l'unité. La teneur en matière sèche des tubercules a été augmentée en culture associée et les dégâts d'insectes sur tubercules et sur feuillages diminués. Les résultats sont interprétés en termes d'efficacité accrue de l'utilisation de la lumière par la Pomme de terre cultivée au voisinage du maïs.

INTRODUCTION

High temperature represents a serious limitation to the extension of potato production, traditionally in temperate climates, to warmer areas where consumer demand for potato is great (VANDER ZAAG and HORTON, 1983). Efforts are underway at the International Potato Center (CIP) to identify practical modifications of the micro-environment in the warm tropics that would favour potato production.

One way of cooling the micro-environment is to capitalize on the shade of associate crops represents. Previous studies by MIDMORE et al, (1983) have reported on the use of maize or coconut as the source of shade. With maize, a relay cropping system was tested in which potato was planted into a senescing maize crop the latter at commercial density and intercepting up to 80 per cent of incident light. When potato was planted beneath coconut palms, 15 per cent of incident light was intercepted by the palms and 85 per cent reached the potato. With both cropping systems, improvement of potato emergence and establishment in shaded plots was attributed to reduced soil temperatures and conservation of soil moisture.

High soil temperature late in the potato crop is also detrimental to tuber yield, particularly when haulms lodge and expose the soil to incoming radiation. Reduction in soil temperature during the latter part of bulking in warm environments, by means of soil reflectans, leads to yield improvements of up to 50 per cent (MIDMORE, 1984). Attemps to reduce soil temperature during bulking by a single application of mulch at planting have been largely unsuccessful, since the reflective and insulatory characters of mulches, important for soil cooling, degenerate as the season progresses (MIDMORE et al., 1985). As an alternative, the potato can be planted at the same time with a companion crop, which intercepts radiation excessive to the needs of the potato crop and, simultaneously reduces soil and air temperature favouring the potato.

There are few published studies on shading and intercropping of the potato. A study done in Kenya at 1 800 m, reports that the yields (on a per plant basis) of potato planted three weeks after maize (FISHER, 1977) ranged from 25 per cent to 75 per cent of the yields of the sole potato crop. The reduction in potato yield was not, however, compensated by equivalent increases in maize yield, hence the land equivalent ratios (LER) did not exceed one. Artificial shade