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Assessment of Rhizoctonia Inoculum's Density in Commercial Potato Fields of Sudan
(Brief Article)

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Abstract. The study was conducted to assess the density of *Rhizoctonia solani* inoculums in the commercial potato fields located along the Nile river in central Sudan. Samples were collected during the 1999/2000 season from three localities; El-Naya (45 km north of Khartoum North), El-Saggi (38 km north of Khartoum North) and El-Shegla (45 km south of Khartoum). Saprophytic activity of *R. solani* was assessed twice; before the planting of potato (i.e. after flood recess) and after harvesting using tissue colonization technique (table beet seeds *Beta vulgaris* L.). The mean inoculums density was increased significantly more than twice after crop harvest compared to before planting ($P > 0.000$). The inoculums density in El-Shegla soil was increased more than 500%. The result was discussed in the potential use of contaminated seed tubers in the cultivation of potato crop in Sudan.

Introduction

Potato is an important food crop in Sudan, with which about 15,000 hectares are cultivated annually with yield estimated around 7,381 kg/Ha (FAO, 2002). The crop is grown along the Nile river fields in the central Sudan, where over 70% of the total production is produced (Genief, 1989). Recently, black scurf of potato caused by *Rhizoctonia solani* Kuhn has become one of the most important factors that has influenced the crop yield significantly. It has been suggested that the disease developed and spread unwittingly through the planting progressive generations of seed tubers produced locally (Magzoub, 1999).

The disease pathogen *Rhizoctonia solani* Kuhn is a ubiquitous soil-borne fungus that combines strong saprophytic capabilities with facultative parasitism of a wide range of host plant species. Determining the density of *R. solani* inoculums in fields before and after planting might be allocated by the source of the pathogen, and hence could assist the management of the disease significantly. Mainly, the detection of live propagules of the pathogen could enable a risk prediction scheme to adopt the most appropriate control strategy (i.e. applying fungicide or soil sterilization treatment on a rational basis), and this was the main objective of the present study.

Material and Methods

Soil samples were collected during the season 1999/2000 from the three localities; El-Naya (45 km north of Khartoum North), El-Saggi (38 km north of Khartoum North) and El-Shegla (45 km south of Khartoum). The localities were distributed along the river Nile in central Sudan. The samples were collected twice before planting (i.e. after the recess of the river Nile flood) and after harvesting of the crop. Three different field strips were chosen randomly at each locality and from each field, soil was dug out from a depth of 10-15 cm from three different sites selected randomly. The samples were brought for culturing and assessment in the laboratory at the Faculty of Agriculture, University of Khartoum. The saprophytic activity of *R. solani* was assayed and estimated with a tissue colonization technique using water agar medium (2% agar) following the method of Papavizas *et al*. (1975). Rose Bengal (0.2 g/L) was added to the medium after being autoclaved at 48-50°C. Then, the medium with Rose Bengal was distributed in petri dishes (15 ml/dish). One gram of autoclaved table beet (*Beta vulgaris* L.) seeds was mixed with 100 g of each soil sample in a petri dish (9 cm diameter). After two days of incubation in soil, the beet seeds were retrieved with sterilized forceps, washed for 20 minutes in sterilized distilled water and transferred to the water agar medium (8 seeds/dish). Three plates were used per sample then incubated at 25°C for 24 hours. The seeds were examined with a compound microscope for *R. solani* colonization. The inoculums density was expressed as a percentage by dividing the number of beet seeds that had become colonized with *R. solani* growth to the total number of beet seeds mixed with soil sample in the water agar.

The data was analyzed using SPSS (version 12) for Windows. The variations in the pathogen density between the two different periods of sampling at different localities were compared using Student T-test.

Results

The inoculum density in El-Saggai, El-Naya and El-Shegla was increased significantly from 40.55%, 36.32% and 15.56% before planting to 87.66%, 78.10% and 91.92% after harvesting respectively (P > 0.000). The highest significant increase of inoculums was found in El-Shegla (76.36%) compared to the other two sites; El-Saggai (47.11%) and El-Naya (41.78%) (Fig. 1). Generally, the mean inoculums density was increased more than twice to several times after the crop harvest compared to that before planting (i.e. after flooding).

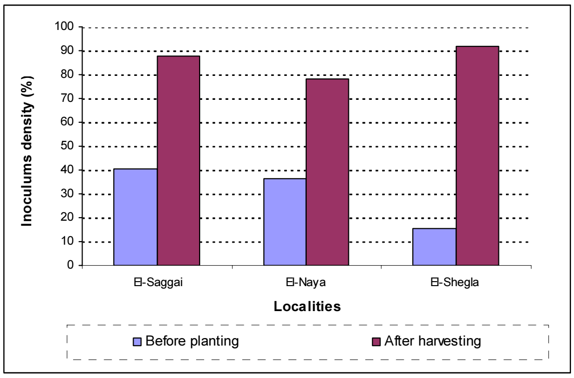

Fig. 1. Rhizoctonia inoculums density (%) before planting and after harvesting in commercial potato fields in three sites located along the river Nile in central Sudan during the season 1999/2000.

Discussion

The results gave an indication of the involvement of the tuber phase of the disease in the replenishment of the soil phase. The previous observation of (Magzoub, 1999) reported a significant increase in the incidence of the disease during progressive generations of seed tubers cultivated in these areas. It is likely to be that the destructiveness of the disease is combined with the unwitting spread of the pathogen in seed tubers. This was supported by the significant increase in the inoculum density of the pathogen after harvest that could be attributed to planting contaminated seed tubers. In fact, in these sampling fields, the crop is grown annually by seed tubers produced locally. In areas described by continuous cultivation, the tuber inoculums are the major cause of disease infection (Frank and Leach, 1980). Likely, the soil phase of *Rhizoctonia solani* (the appropriate anastomosis group) seems to be replenished by the use of infested seed tubers. These constitute important ecological considerations in our country that could be manipulated in achieving a practical management of the disease. So, a program on the utilization and adoption of certified seed tubers with farmers should be considered as the first line for controlling the disease. However, the soil inoculums reservoir is apparently subject to the influence of environmental factors including water flooding soil that may be caused the reduction of the inoculums after the recess of the river Nile flood. A future research on the disease perspectives should consider emphasizing these environmental factors for the suppression of inoculums density of the disease.

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تقدير كثافة لقاح فطر الرايزوكتونيا
في تربة حقول تجارية لزراعة البطاطس بالسودان
(بحث مختصر)

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كلمات مفتاحية: بطاطس، فطر الرايزوكتونيا، كثافة، تربة، السودان.

ملخص البحث. أجريت هذه الدراسة لتقييم كثافة لقاح فطر الرايزوكتونيا سولاني في حقول البطاطس التجارية الواقعة على نهر النيل في وسط السودان. جمعت العينات خلال الموسم 1999/2000م من ثلاث مناطق هي: النية (45 كم شمال الخرطوم بحري)، والسقاي (38 كم شمال الخرطوم بحري)، والشقله (45 كم جنوب الخرطوم). تم تقييم النشاط الترممي للرايزوكتونيا سولاني مرتين: مرة قبل زراعة محصول البطاطس (أي بعد انحسار مياه الفيضان)، ومرة بعد الحصاد، وذلك باستخدام تقنية استعمار الأنسجة بواسطة بذور البنجر. زاد متوسط الكثافة في كثافة اللقاح بشكل معنوي بعد حصاد المحصول وذلك بأكثر من مرتين مقارنة بقبل الزراعة (الدرجة المعنوية < 0.000). كانت هذه الزيادة في كثافة اللقاح أكثر من 500٪ في منطقة الشقله. وناقشت هذه النتيجة إمكانية استخدام تقاوي ملوثة في زراعة البطاطس بالسودان.