
Seed microflora of some high yielding semi deep water rice varieties and their effect on seed germination

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Seed microflora of 15 varieties of semi deep water rice were studied by employing the standard blotter method and direct seed inoculation in agar which provided a complete picture of the seed microflora of the varieties. In total 16 fungal taxa belonging to nine genera along with a single bacterium were isolated. Of them *Trichoconis padwickii* was the dominant one. Among the seed varieties OR1206-29-2 contained the highest percentage incidence of fungi and showed the lowest percentage of seed germination. Whereas the variety Mahalaxmi was free from any microbes with highest percentage of seed germination. Higher microbial association showed decreased rate of seed germination.

Key words : Semi deep water rice, fungal composition, high yielding varieties

INTRODUCTION

During harvest and transit a large number of microorganisms get deposited on seed surfaces. Sources of these microbes are plants (living and dead) and air of the locality. Besides, pathogen specific to plants are often carried by seeds which are the main source of dispersal. Microflora of plants and air of different regions considerably vary in composition and concentration and so also of seeds. Therefore, it is necessary to have adequate knowledge of seed microflora (both saprophytes and pathogens) of every region before they are disposed to farmers.

Rice (*Oryza sativa*) the most important staple crop is extensively cultivated in almost all parts of India as well as many parts of the world. The semi deep water rice is mainly cultivated in marshy and water deposited lands of coastal and high rainfall areas. Management of diseases and pests in these semi deep water rice fields is very difficult due to high water levels in the fields. So, it is necessary to use seeds and seedlings which should be free from diseases and pathogens for cultivation. This paper represents the seed microflora (both saprophytes and pathogens) of some high yielding semi deep water rice varieties.

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MATERIALS AND METHODS

Seeds of 15 varieties of high yielding rice in 250 g lots, cultivated in Central Farm, OUAT, Bhubaneswar, were supplied by Directorate of Rice Research, Rajendranagar, Hyderabad, for screening of the varieties in 1993 kharif season. The seeds were stored under laboratory conditions till next sowing (1994 kharif) season. The microflora of the seeds were studied by employing the Standard Blotter Method (ISTA, 1966) and direct seed inoculation in agar (Ramnath *et al.*, 1970; Agarwal *et al.*, 1972; Sahu, 1994). A lot of 600 seeds of each variety were taken out, of which 400 seeds were used for microflora study and another 200 for germination test. Twenty seeds in ten replicates were inoculated in sterile moist blotter chamber and another 20 seeds in ten replicates were inoculated in sterile agar plates and incubated in the laboratory. The study was started after 7 days of inoculation till the end of the month. The germination trial was done taking 200 seeds in sterilized moist chamber. The percentage of microbial incidence and germination was calculated using the formula :

$$\text{Number of seeds associated with microbes / germinated} / \text{Total number of seeds studied} \times 100$$

RESULT AND DISCUSSION

The present seed microflora study was a survey and enumeration of fungi and bacteria associated with different seed varieties of rice cultivated in semi deep water situations of eastern India. Percentage incidence of fungi and bacteria along with seed germination in different seed varieties is given in Table 1. A total of 16 fungal taxa within 9 genera and a single bacterium (*Xanthomonas campestris*) were isolated from the seed varieties. The seeds of variety OR1206-7-1 contained the highest (21.0%) percentage incidence of microbes followed by OR1206-25-1 (20%) and OR1195-2(19.0%). The variety Mahalaxmi is totally free from any microbe. Excluding this the variety OR1206-26-2 showed the lowest (5.0%) percentage incidence of microbes followed by OR888-4-30 (6.0%) and OR 912-10-190 (8.0%). When the fungal and bacterial composition of the seed varieties of rice was considered, *Trichoconis padwickii* was found associated with highest (11) number of seed varieties followed by *Fusarium oxysporum* (10) and *Dreschlera oryzae* (8). *Xanthomonas campestris* was associated with only five varieties of rice seeds out of fifteen varieties. Fungi like *Aspergillus flavus*, *Fusarium equiseti* and a species each of *Epicoccum* and *Penicillium* were associated with only a single variety of rice seeds.

The highest percentage of seed germination was observed in variety Mahalaxmi which was free from any microbe followed by OR888-4-30 (92%) and OR1206-26-2 (89%) which showed incidence of microbes in 6.0% and 5.0% of seeds respectively. The lowest (62%) percentage of seed germination was recorded in the variety OR1195-2 which contained 19.0% incidence of microbes followed by OR1206-7-1 and Kanchan which contained 21% and 16% incidence of microbes respectively.

To draw a relationship between the percentage germination of seeds and percentage incidence of microbes of the varieties, it was subjected to regression analysis and presented in Fig. 1. The 'r' value was found to be 0.926 and was significant in the probability level of 0.001. The rate of seed germination decreased with increase of microbial association in the seed varieties. The seed varieties which showed higher incidence of microbes were

poor in germination, the variety which was free from any microbes showed the highest germinability.

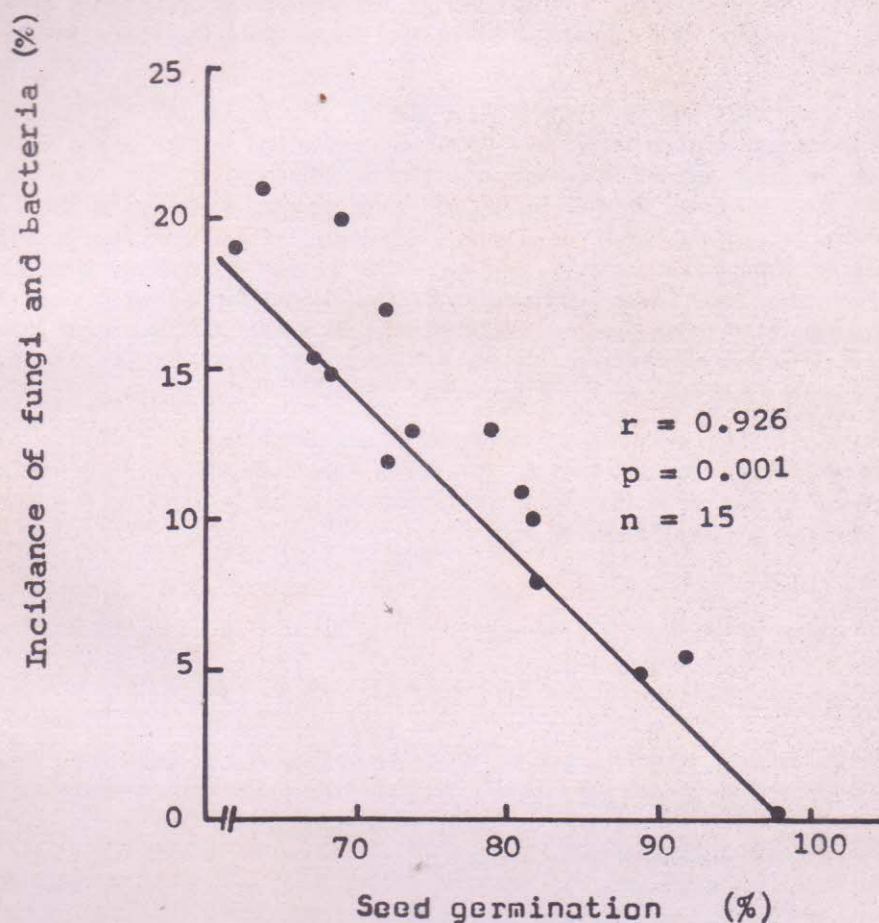


Fig. 1. Regression of incidence of fungi and bacteria (%) vs. Seed germination (%)

The present study employed the blotter method and agar inoculation method which were widely used by a large number of seed pathologists (ISTA, 1966; Cristensen, 1951; Prado and Christensen, 1952; Sharma *et al.*, 1992). Both the techniques accounted a complete structure of seed microflora. The fungi that have poor growth in the natural medium (blotter method) can grow better in agar nutrient medium.

The kinds of fungi and bacteria of the varieties of rice seeds of the present study were similar to the seed microflora of other studies (Prado and Christensen, 1952; Agarwal *et al.*, 1972; Christensen and Kaufman, 1964) with the exception that *Trichoconis padwickii* was considerably more prevalent. The predominant field fungi differed somewhat according

to crop, the region or the geographic location and the weather but in wheat, rice, barley and oats grown in much of the world the major field fungi that invaded the kernels were species of *Alternaria*, *Cladosporium*, *Helminthosporium* and *Fusarium* (Christensen and Kaufman 1969b). The fungi like *Macrophomina*, *Helminthosporium*, *Fusarium* isolated from seed varieties, were considered as the field fungi and got associated with the seeds before harvest of the crop in the field. The other fungi like members of *Aspergillus*, *Penicillium*, *Drechslera*, *Curvularia* were considered to be the storage fungi harvested by the seeds during storage.

Germination percentage and germination vigor are affected by a number of factors - the conditions at harvest, seed maturity, seed dormancy, mechanical damage to the seed during harvest and handling age of the seed and greatly influenced by the seed microflora (Christensen and Kaufman, 1969a). Field fungi may discolor seeds, cause death of the ovules, shrivelling of the seeds or kernels, weakening or death of the embryos and development of compounds toxic to man and other animals (Christensen and Kaufman, 1969b). The seeds which were associated with more amount of microbial count showed lesser percentage of germination. The percentage of germination decreased with increase of incidence of microbes in the seed varieties (Fig.1). This suggested that the fungi and bacteria gradually weakened and killed the seeds.

At present there is no microbiological evaluation of any agricultural seed when it goes into storage or distributed to the farmers for raising seedlings. If practical methods of microbiological evaluation of the quality and storability of seeds could be developed they might be of value for many kinds of seeds.

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