Der Tropenlandwirt, Zeitschrift für die Landwirtschaft in den Tropen und Subtropen
81. Jahrgang, April 1980, S. 50–54

Effect of Antibacterial Antibiotics on the Sporulation of Seedborne Trichoconis Padwickii Ganguly by Blotter Testing Technique

Die Untersuchung des Einflusses von antibakteriellen Antibiotikas auf die Sporenbildung von Trichoconis padwickii Ganguly durch die Fließpapiermethode

Chukwunyeaka Iloba*)

1. Introduction

Rice cultivation is having a new dimension in Nigeria, culminating from the Operation Feed the Nation and the National Accelerated Food Production Programmes. Noble and Richardson (10) have observed various seed-borne diseases of rice. Trichoconis padwickii is one of those with considerable economic importance.

Bacterial blight and bacterial leaf streak caused by Xanthomonas oryzae and X. translucens respectively have been reported in areas with high rainfall and humidity (9). These bacterial diseases have also been observed in West Africa (1). Rice cultivation therefore faces not only fungal, but also bacterial problems. These causal organisms ought to be detected through seed health testing of rice intended for sowing. Depending on the substrate moisture level during incubation period, Limonard (7) noticed bacterial antagonism against fungi whenever it was high. This phenomenon, which Limonard (8) termed "Wet Blotter Effect" resulted to a lower infection percentage of some fungi. In our earlier investigation, higher moisture gave lower though insignificant infection percentage (4). It is the aim of this paper to report the result of the investigation whether bacterial antagonism against. T. padwickii was possible under blotter testing technique.

*) Dr. Chukwunyeaka Iloba, Lecturer in Plant Pathology in Crop Science Department, University of Nigeria, Nsukka-Nigeria.
Address: 242 Ikejiani Avenue, University of Nigeria, Nsukka.

2. Materials and Methods

Three layers of white filter (blotter) papers were placed in white plastic petri dishes and then moistened with 12 ml of tap water, 12 ml of 100 ppm of Streptomycin sulphate and Oxytetracycline hydrochloride respectively. These antibacterial antibiotics were produced by Novo Industry A/S Copenhagen, Denmark and Pfizer Brussels, Belgium respectively. The control was the standard moisture level of the ISTA (4) which reflected about 8 ml per petri dish.

Eight samples of rice with high infection of T. padwickii were used in the investigation. Twenty-five seeds which were selected at random from each of the samples were plated on the moistened substrates respectively to constitute a plot. All the four treatments were replicated sixteen times.

Incubation was for eight days at an average temperature of 20° C under alternating 12 hours of ultraviolet irradiation and complete darkness cycles respectively. Identification exercise as well as sporulation intensity (SI) evaluation followed the pattern already discussed in earlier paper (4).

3. Results and Discussion

The incidence of T. padwickii varied with the substrates as well as moisture levels (Table 1). Discrepance existed in infection count between the untreated on one hand and the treated varieties on the other.

The standard moisture level as against saturated moisture of 12 ml tap water had infection percentages of 47.3 and 50.1 respectively. The saturated but treated substrates gave higher infection counts. The substrate with Streptomycin sulphate gave a mean infection count of 65.1 cent, while the one with Oxytetracycline hydrochloride had an average infection percentage of 63.3. Infection intensity of the fungus based on SI-scores showed slight difference between the two untreated levels. The standard moisture level had an average of 68.5 as against 68.3 for the saturated moisture level. The incidence of the fungus which was found in the treated substrates to be higher was again accentuated by the SI-scores. The saturated substrate with Oxytetracycline hydrochloride scored an average of 91.1 as against a mean of 87.3 for the substrate with Streptomycin sulphate.

Whether the higher values obtained under treated substrates were accountable to the suppression of bacterial antagonism against the fungus as was observed by Limonard (7) could be positively assumed. When on the other hand it is considered that saturated substrate, which is supposed to be hydrophobic to the fungus gave higher incidence (50.1 %) than the standard moisture level with a mean of 47.3 per cent, the speculation on bacterial antagonism becomes negated. Even the SI-scores under both untreated levels were approximately same, despite the difference in substrate moisture contents. All these evidence seem to point to the absence of bacterial antagonism to the fungus.

Table 1: Infection percentage (IP) and Sporulation Intensity (SI) based on Index of Infection scores of various substrate levels.

Substrates	8 ml Standard Moisture level		12 ml Tap Water		12 ml Streptomycin (100 ppm)		12 ml Oxytetracycline (100 ppm)	
Parameters	IP	SI	IP	SI	IP	SI	IP	SI
Sporulation* Levels	H M L	H M L	H M L	H M L	H M L	H M L	H M L	H M L
Sample Nos.								
1	7 10 19	21 20 19	10 6 32	30 12 32	7 13 38	21 26 28	8 12 32	24 24 34
2	14 10 26	42 20 26	11 6 32	33 12 32	15 16 37	45 32 37	6 19 40	18 38 40
3	13 17 29	39 34 29	9 14 38	27 28 38	11 17 46	33 34 46	11 24 36	33 48 36
4	4 12 49	12 24 49	3 11 43	9 22 43	5 13 58	15 26 58	4 15 53	12 30 53
5	1 3 37	3 6 37	1 3 30	3 6 30	1 4 65	3 8 65	2 13 44	6 26 44
6	3 5 23	9 10 23	1 8 39	3 16 39	2 6 48	6 12 48	7 13 43	21 26 43
7	3 6 30	9 12 30	2 6 31	6 12 31	2 6 41	6 12 41	3 8 39	9 16 39
8	3 11 43	9 22 43	2 8 50	6 16 50	4 8 58	12 16 58	8 22 42	24 44 42
Total Average	47.3	68.5	50.1	68.3	65.1	87.3	63.3	91.1

* H = Heavy sporulation intensity, M = Moderate sporulation intensity, L = Light sporulation intensity.

The paucity of information however, makes the interpretation of the higher values under treated substrates not easy. Various compounds have been known to be metabolised and effectively utilised by some microorganisms. Gottlieb and Siminoff (2), Waksman and Woodruff (11) have opined that Antibiotics like Chloromycin and Actinomycin are also effectively inactivated by microorganisms. Fungi are involved in this process and are therefore stimulated by some chemical compounds (6, 3). Rather than the nullification of bacterial antogonism which does not seem to exist, T. padwickii may have been stimulated by both antibacterial antibiotics, which are specifically bacteriocides and non-fungitoxic. This assumption raises no doubt an important point for further investigation in seed health testing exercise. Trace infection of economically important seed-borne pathogens must be detected to make the exercise meaningful. Whether the use of antibacterial antibiotics would make the testing technique more sensitive is yet to be established.

4. Summary

Laboratory investigations were carried out aimed at establishing bacterial antagonism against seed-borne Trichoconis padwickii Ganguly by blotter method. Eight samples of rice seeds were used. The moisture levels investigated were the standard moisture level (ISTA 1966), 12 millilitres (both of which were from tap water), 12 ml of 100 ppm of Streptomycin sulphate and another 12 ml of 100 ppm of Oxytetracycline hydrochloride.

There was clear difference both in terms of infection percentage and infection intensity between the treated and untreated substrates. This difference was also evident even between the untreated varieties as well as between the two substrates with antibacterial antibiotics. Though both treated substrates had higher infection counts and disease intensity than the untreated substrates, ist was doubtful whether bacterial antagonism against T. padwickii could be sufficiently established. The mere fact that standard moisture had a lower infection count of 47.3 % than the saturated moisture level with an infection percentage of 50.1 negates the possibility of bacterial antagonism against the fungus.

Zusammenfassung

In Laboruntersuchungen wurde an acht Reissamenproben unter Anwendung der Fließpapiermethode der bakterielle Antagonismus gegen den samenbürtigen Pilz Trichoconis padwickii Ganguly untersucht. Die geprüften Substrate bestanden aus 8 ml (Standardlösung, (ISTA 1966) und 12 ml Leitungswasser sowie Lösungen von 12 ml Streptomycin-Sulfat (100 ppm) und 12 ml Oxytetracyclinhydrochlorid (100 ppm).

Zwischen den Kontrollösungen und den Antibiotika-Substraten ergaben sich deutliche Unterschiede in der Infektionsrate und -stärke. Die Unterschiede waren sowohl zwischen den beiden Kontrollösungen als auch zwischen den verschiedenen Antibiotika-Substraten klar erkennbar. Obwohl durch Zugabe von Antibiotika Infektionsrate und Krankheitsintensität zunahmen, ist es zweifelhaft, ob ein bakterieller Antagonismus gegen T. padwickii vorliegt. Die bloße Tatsache, daß die Infektionsrate der Standardlösung mit 47,3 % niedriger liegt als die der 12 ml Kontrollösung mit 50,1 % verneint die Möglichkeit eines bakteriellen Antagonismus gegen den Pilz.

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