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CONTROL OF GUAVA FRUIT ROT CAUSED BY PESTALOTIA PSIDII WITH HOMOEOPATHIC DRUGS

K. K. Khanna and S. Chandra

Department of Botany, University of Allahabad, Allahabad India.

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ABSTRACT

The effect of 1-200 potencies of four homoeopathic drugs (Kali iodide, Arsenicum album, Thuja occidentalis, and Blatta orientalis) on the spore germination of Pestalotia psidii, the causal organism of guava fruit rot, was studied. Kali iodide potencies of 1, 20, 24, 61, and 87 and Arsenicum album potencies of 60, 65, and 181 inhibited spore germination completely. Kali iodide potencies of 1, 20, 24, and 61 and Arsenicum album potency of 60 inhibited growth of the pathogen. Fruits treated with some of the effective potencies of drugs before inoculation did not develop rotting. The use of these potencies of the drugs may be recommended for control of the disease.

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Few reports have appeared in recent years in which homoeopathic drugs have been shown to retard the multiplication of viruses within plant tissue (3, 5). The authors (unpublished) have found homoeopathic drugs to be active against some fungal plant pathogens. This paper reports the effect of some of these drugs in vitro and in vivo on the spore germination and growth of Pestalotia psidii Pat., the fungus causing fruit rot of guava.

MATERIALS AND METHODS

Four homoeopathic drugs that are known to cure fungal diseases of human beings were used in this investigation. They are: Kali iodide (potassium iodide), Blatta orientalis (an extract of cockroach), Arsenicum album (arsenic oxide), and Thuja occidentalis (a plant extract). The fungitoxicity of drugs was determined in terms of the inhibition of spore germination of the causal fungus. The effect of 1-200 potencies of these drugs was studied. Potencies of the drugs were prepared in distilled water on a centesimal scale (from 1-200), as described in M. Bhattacharyya & Co's Homoeopathic Pharmacopoeia (4). One part of the mother tincture (a concentrated solution of drug) and 99 parts of distilled water were mixed in a phial by means of 10 powerful strokes. The solution was regarded as a drug having one potency and was denoted by the number 1. To make subsequent potencies, 1 part of the preceding potency and 99 parts of distilled water were mixed in a phial and were denoted with increasing potency numbers such as 2, 3, 4 ..... 200. Before use, the drugs were sterilized by filtration through a Gena sintered glass filter G5m. Spores of the pathogen were suspended in different potencies of the drugs, and the hanging drop technique of Hoffman (2) was used to determine percentage spore germination. There were three replicates per treatment, and the mean value of the replicates was recorded. Percentage spore germination was recorded after an incubation of 8-12 hours. The results were analyzed statistically. Potencies of the drugs that inhibited spore germination completely were screened further by the agar-cup method to determine their effect on growth of the fungus. To do this, fungus spores were mixed aseptically in melted solid Asthana and Hawker's medium 'A' (1), and then poured into sterilized petri dishes. After solidification, a circular cavity (10 mm diam) was made in the center of the petri dish with a cork borer. The cavity (cup) was filled with the sterilized drug, and the petri dish was incubated at 28°C for 72 hours. Formation of an inhibitory zone (no growth of the pathogen) around the cavity indicated inhibition by the drug of growth of the pathogen.

For in vivo studies, only those potencies of the drugs that inhibited spore germination completely were used. Healthy, ripe guava fruits, cultivar Safeda, were used. Fruits were first disinfected with 90% alcohol, and then injured by a pin-prick. Injured fruits were sprayed with a spore suspension of the organism, and after incubation for 3-4 hours, they were dipped for 2 min in different potencies of the drugs. In another series of experiments, injured fruits were dipped in different potencies of the drugs for 2 min before inoculation. In both series of experiments 50% of the fruits were treated with the drugs alone and the other 50% were treated with the drugs containing glycerol (added as an adjuvant) at the rate of 10 cm^3 per liter. Treated fruits were stored in glass chambers at 25°C (±2°). In the control series, inoculated fruits were dipped in sterilized distilled water instead of a drug. In all cases five replicates of 12 fruits (6 fruits for drug alone and 6 fruits for drug + glycerol) each were taken. After an incubation of 8 days, the fruits were removed from the glass chambers and percentage of rot development was determined. The results were analyzed statistically by Duncan's Multiple Range Test.

RESULTS

Several potencies of the four drugs inhibited spore germination. Complete inhibition of spore germination, however, was caused only by potencies 1, 20, 24, 61, 87 of Kali iodide and 60, 65, 181 of Arsenicum album. When the effect of the potencies that inhibited spore germination completely was screened by the agar cup method, of the eight potencies only five (1, 20, 24, and 61 of Kali iodide and 60 of Arsenicum album) produced an inhibitory zone around the cavity (Fig. 1, avg diam of inhibitory zone was 21.5 mm in Kali iodide 1, 24, 61, and 18.7 mm in Kali iodide 20 and Arsenicum album 60). Thus only these five potencies checked growth of the pathogen.

Results of the efficacy in checking activity of the fungus in vivo of the eight potencies that checked spore germination in vitro are shown in Table 1. Statistical tests based on analysis of variance were conducted to determine the significant differences between various strains. The analysis of variance corresponding to various treatments revealed that although the block differences were not significant, the differences due to strains were highly significant (Table 1).

Table 1. Percentage rot of guava fruits treated with various homoeopathic drugs[a].

Drugs	Preinoculation treatment: Drug	Preinoculation treatment: Drug with glycerine	Postinoculation treatment: Drug	Postinoculation treatment: Drug with glycerine
Kali iodide				
Potency 1	4.7 a	0 a	53.8 a	45.5 a
20	8.4 b	12.7 b	63.8 ab	42.7 b
24	21.7 c	17.4 c	45.0 a c	40.9 b
61	6.3 ab d	15.7 bc	71.6 b d	54.9 c
87	0 e	30.1 d	63.2 ab de	74.8 d
Arsenicum album		d		
Potency 60	2.7 a ef	4.0 e	71.8 b def	76.9 e
65	7.1 ab d	0 a f	56.3 abc e	61.9 f
181	0 ef	0 a f	73.5 b defg	78.1 e
Control	89.2 g	88.5 g	85.5 g	87.3 g
Critical difference at 5% level	3.22	3.52	13.51	2.03

[a]Results were analyzed statistically by analysis of variance and Duncan's Multiple Range Test at 5% level. Numbers followed by the same letter are not significantly different within columns.

All eight drug potencies successfully retarded the development of fruit rot. Compared with the controls (Fig. 2), drug-treated fruits always developed less rot; however, the effect of drugs was more pronounced when applied before inoculation. Except in a few cases, the retarding effect caused by the drug alone was not less than that caused by the combination of drug and glycerol. Kali iodide potencies 1 and 87, and Arsenicum album potencies 65 and 181, were most efficacious in checking the fruit rot; fruits treated with them showed no rotting, even after prolonged incubation.

DISCUSSION

The results of the present study indicate that certain homoeopathic drugs can be used for control of some diseases caused by fungi. Some of the potencies of the drugs employed in the investigation not only checked spore germination and growth of Pestalotia psidii in vitro, but also retarded activity of the pathogen in vivo. The drugs had no adverse effect on the guava fruits.

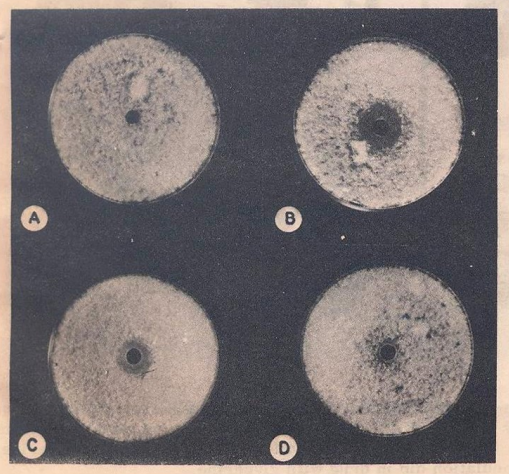

FIGURE 1. Effect of various homoeopathic drugs on the growth of Pestalotia psidii. Darker area around the black spot in the center (cavity) indicates inhibition zone. A -- Control. B -- Kali iodide potency 1. C -- Kali iodide potency 20. D -- Arsenicum album potency 65.

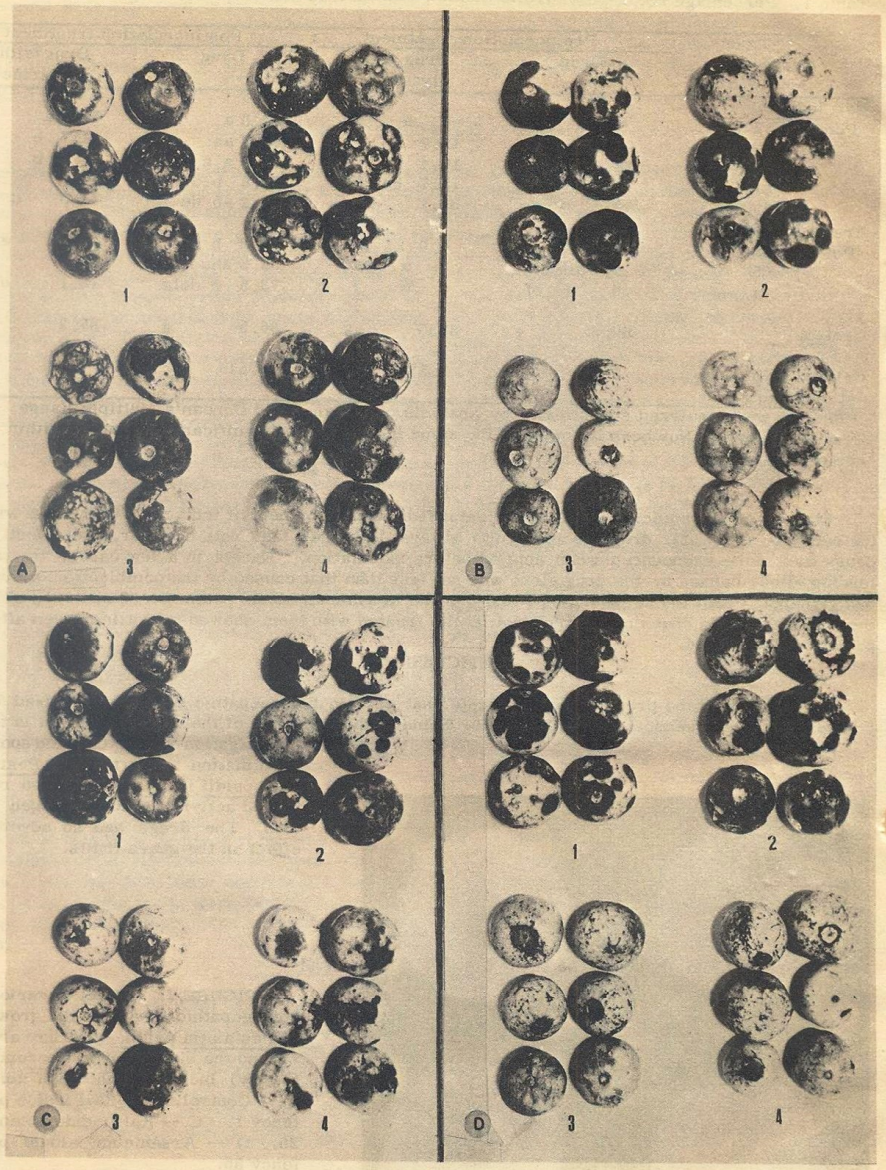

FIGURE 2. Guava fruits given pre- and postinoculation dips in various homoeopathic drugs. A -- Control. B -- Kali iodide potency 1. C -- Kali iodide potency 20. D -- Arsenicum album potency 181. 1) Postinoculation dip in drug; 2) Postinoculation dip in drug with glycerine; 3) Preinoculation dip in drug; 4) Preinoculation dip in drug with glycerine.

Several potencies of Kali iodide and Arsenicum album prevented development of the disease, nd thus successfully controlled the fruit rot of guava; however, the retarding effect of the drugs as more pronounced when fruits were treated before inoculation. This clearly indicates that ne drugs are effective as protectants rather than as therapeutants. Kali iodide 87 and Arsenicum album 65 and 181, which inhibited spore germination of P. psidii completely, did not check rowth of the fungus on Asthana and Hawker's medium. In spite of this, they were equally ffective in controlling the disease. Because it is economical to use higher potencies of the rugs, Kali iodide 87 and Arsenicum album 181 may be recommended for the control of the isease. The combination of drug and glycerol was not superior to the drug alone.

The noneffectiveness of some of the drug potencies to check the disease in vivo, when ney were effective in vitro, might be due to some negative effect caused by the host or its xudate.

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