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Studies on the control of Anthracnose disease of Dolichos lab-lab*

by

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Synopsis: Systemic chemicals were tested for their efficacy to control anthracnose disease of *Dolichos lab-lab* caused by the fungus *Colletotrichum lindemuthianum*. Among them only nickel chloride was absorbed by the plant through the roots and gave protection from infection. Systematic translocation of nickel chloride was also confirmed by the absence of growth of the fungus around the leaf discs taken from the nickel chloride treated seedlings when incubated in a petri dish containing potato dextrose agar seeded with conidia of *Colletotrichum lindemuthianum*. Nickel chloride solution applied to the soil was also absorbed by the plant through the root and afforded resistance to infection. Treating the seeds in nickel chloride solution (2 ppm.) before sowing, prevented infection up to 13 days after germination.

Introduction: Most of the fungicides used in the control of plant diseases are applied to plant surfaces with the intent of preventing fungi from gaining entrance. In other words, these fungicides are 'protective' in their action. Fungicides capable of killing fungi when absorbed by the plant are eradicative in their action. In the present investigations on the control of anthracnose disease of *Dolichos lab-lab* the effect of certain systemic fungicides has been tested.

A perusal of the literature shows that there are no reports of systemic chemicals, used for the control of anthracnose disease of *Dolichos lab-lab*, However, Grummer and Mack (1955) reported that bean anthracnose could be completely eliminated from seeds by immersing them for 24 hours in 0·05% solution of streptomycin.

Materials and Methods: An experiment was conducted to find out the effect of systemic chemicals on *Dolichos lab-lab* seedlings by dipping the roots. Diseased *Dolichos lab-lab* seeds were soaked in different solutions: terramycin (100 ppm), streptomycin (100 ppm), griseofulvin (100 ppm), captan (1000 ppm), dithane z·78 (1000 ppm), salicylic acid (5 ppm), p. aminobenzoic acid (2 ppm), nickel chloride (2 ppm) and phenyl mercury acetate (1 ppm) for three hours. Seedlings with a pair of leaves, were pulled out from the pots and kept with the roots dipped in the respective solutions of the fungicides for four hours. On the fifth day leaves were inoculated with spore suspension of *Colletotrichum lindemuthianum* and kept covered with alkathene bags for three days.

In another experiment one week old seedlings were pulled out and kept with the roots dipped in 2 ppm. nickel chloride solution for four days. Control plants were kept with the roots dipped in water. On the fifth day discs of 5 mm. diameter were cut out from the leaf with the help of a sterilised cork borer and

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six leaf discs were incubated in a petri dish containing potato dextrose agar seeded with conidia of *Colletotrichum lindemuthianum* (5 cc of spore suspension was mixed with 20 cc of potato dextrose agar). Five replications were maintained.

In a third experiment using the variety DL. 453 the soil around one week old seedlings raised in pots was drenched with 2 ppm. nickel chloride solution. Control pots were drenched with water. Subsequently, treated as well as control series were watered once in a day. Seedlings were inoculated with the spore suspension of *Colletotrichum lindemuthianum*.

Investigations were conducted to find out the length of time up to which the effect of nickel chloride would last when the seeds were soaked in this solution. Seeds were sown in pots after treating them in 2 ppm. nickel chloride solution for three hours. Seeds were also soaked in water for three hours and sown in pots to serve as control. There were fifteen replications for each treatment. Spore suspension of *Colletotrichum lindemuthianum* was sprayed on the seedlings. Spraying spore suspension was repeated once in every three days.

Results: 1. *Effect of Chemicals on infection of Dolichos lab-lab Seedlings when applied through the root:* The results of the above experiment are presented in Table. I.

TABLE I.

Effect of systemic chemicals on Dolichos lab-lab by dipping the root.

Sl. No.	Treatments	Infection recorded after 3 days of inoculation
1.	Terramycin (100 ppm)	Both leaves infected.
2.	Streptomycin (100 ppm)	,, ,,
3.	Griseofulvin (100 ppm)	Stray infection.
4.	Captan (1000 ppm)	Both leaves infected.
5.	Dithane (1000 ppm)	,, ,,
6.	Salicylic acid (5 ppm)	,, ,,
7.	P. amino benzoic acid (5 ppm)	,, ,,
8.	Calcium chloride (2 ppm)	,, ,,
9.	Zinc chloride (2 ppm)	Stray infection.
10.	Nickel chloride (2 ppm)	Free from infection.
11.	Phenyl mercury acetate (1 ppm)	Both leaves infected.
12.	Control (no treatment) dipping the seedlings in water	,, ,,

Only nickel chloride treated seedlings were completely free from infection while the rest were infected. It was, therefore, evident that nickel chloride was the only chemical systemically absorbed by the plant through the root. The remaining treatments were not effective in protecting the seedlings from infection.

2. *Systemic action of nickel chloride by disc method:* When leaf discs taken from nickel chloride treated seedlings, were incubated in Petri dishes seeded with *C. lindemuthianum* spores, 2 mm. wide zones were observed around the leaf discs after 2 days of incubation. This indicated that nickel chloride had been absorbed by the plant and translocated to the leaf. The zone formation was absent in the control leaf discs.

3. *Drenching the soil with nickel chloride solution and its effect on infection of Dolichos lab-lab seedings by anthracnose:* In this experiment the control plants took infection three days of inoculation, while the seedlings treated with nickel chloride solution remained free from infection.

4. *Residual effect of nickel chloride:* Results of investigations conducted to find out the length of time up to which the effect of nickel chloride would persist when seeds were soaked in this solution before sowing, are presented in Table II below:

TABLE II

Residual effect of nickel chlorid

Date of sowing.	Date of Germination.	Date of inoculation.	Date of infection noticed on	
			Seedlings raised with nickel chloride treated seeds.	Control (seeds soaked in water and sown.)
13-10-1961	17-10-1961	First inoculation on 24-10-1961	No infection on 26-10-1961	Seedlings infected on 26-10-1961
		Second inoculation on 27-10-1961	Infection just started on 30-10-1961	

The results showed that control plants took infection three days after first inoculation while the seedlings treated with nickel chloride remained unaffected for a period of 13 days after germination. Nickel chloride treated plants were infected only on 14th day after germination.

Discussion: The control of plant disease by chemotherapy has been reviewed by Stoddard and Dimond (1949) and Horsfall and Dimond (1951). Grummer and Mach (1955) have reported that bean anthracnose can be successfully eliminated by immersing the seeds for 24 hours in 0·05% solution of streptomycin. In the present investigations though several chemicals have been tested for their efficacy in the control of anthracnose disease of *Dolichos lab-lab*, only nickel chloride was found to be readily absorbed by the plant system through the roots and exerted a systemic effect in protecting the seedlings from infection. The systemic translocation of nickel chloride has also been confirmed in the present studies.

The absorption of systemic chemicals through the roots has been demonstrated by several workers. Blanchard and Diller (1961) have stated that aureomycin is taken up by the roots of *Phaseolus lunatus* and translocated to the leaves. Mitchell, Zaumeyer and Andersen (1952) have shown that streptomycin applied to stems of *Phaseolus* confers resistance to the leaves against bacterial blight caused by *Psedomonas medicaginis.*

Sempio (1936) has reported the systemic effect of nickel chloride for controlling rust disease of wheat when applied at M/7500 to the plants through the roots. Andersen and Rowell (1960) have also demonstrated the usefulness of nickel chloride as a systemic chemical for the control of wheat rust. In the present investigations nickel chloride solution when applied to the soil is observed to be readily absorbed by the plant through the root and is able to confer resistance to the seedlings against anthracnose disease. Soaking the seeds in 2 ppm. nickel chloride solution for three hours before sowing prevents the incidence of anthracnose disease up to thirteen days after germination. The pretreatment of seeds with nickel chloride solution has also resulted in significant reduction of infection in the treated seedlings.

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