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HOMOEOPATHIC DRUGS IN THE CONTROL OF SOME POST-HARVEST DISEASES OF FRUITS

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Asvagandh 200 (apple and tomato), Kali iodatum 149 (banana), *Lycopodium clavatum* 136 (guava) and *Lycopodium clavatum* 142 (mango) were most efficacious in pre-as well as post-inoculation treatments. Out of five different adjuvants (glycerol, castor oil, paraffinic oil, soap powder and wheat flour) tested in improving the potentiality of the efficacious drugs, soap powder was found to be the most successful. None of the drug treatments caused any change in the quality and palatability of fruits. A comparison of the investment and profit indicated the treatments to be fairly economical in all the cases.

Key Words : Homoeopathic drug, control, fruit rot diseases, post-harvest diseases.

A number of homoeopathic drugs have been shown to exhibit antifungal activity against various pathogens (Khanna and Chandra, 1976a, Khanna, 1993). Their potentiality as safe and economic method of disease control has also been established against certain plant diseases (Khanna and Chandra, 1976b). In one of our earlier report (Khanna and Chandra, 1987), it was indicated that certain potencies of some of homoeopathic drugs could inhibit germination of conidia of *Alternaria alternata* (apple and tomato fruit rots), *Fusarium roseum* (banana fruit rot), *Colletotrichum gloeosporioides* (mango fruit rot) and *Gloeosporium psidii* (guava fruit rot) under *in vitro* condition. The present paper reports results of their *in vivo* evaluations performed with an aim to explore their efficacy in controlling various fruit rot diseases. In order to ensure their practical application, the drugs have been further evaluated with reference to their effect on the quality and palatability of fruits and economics of their application. In addition, potentiality of certain adjuvants in improving the efficacy of drugs in controlling the rots was also evaluated.

MATERIALS AND METHODS

Pure cultures of the pathogens isolated from the diseased fruits were used in the study. Potencies of drugs found effective in inhibiting spore germination under *in vitro* conditions in an earlier study were included in the present evaluation (Khanna and Chandra, 1987). The fruits of susceptible variety available locally ('Safeda' of guava, 'Harichal' of banana, 'Dasheri' of mango, 'American' of apple and 'Type-1'- a local variety of tomato) were included in the study. Both pre-and post-inoculation treatments (prophylactic and therapeutic respectively) were applied to the fruits by the method outlined by Khanna and Chandra (1976b). Five replicates of twelve fruits each were taken for each treatment.

In all five adjuvants *viz*, glycerol, castor oil, paraffinic (mineral) oil @ 10 ml/1, soap powder (Surf-a detergent powder) and wheat flour @ 500 mg/1) were evaluated for their potentiality in improving the efficacy of effective treatments. These were mixed with the effective drug and used for pre-and post-inoculation treatments as described earlier (Khanna and Chandra, 1976b, 1989). All the results were statistically analysed for analysis of variance at 5% level of P.

In order to ensure that drugs do not bring an unfavourable change in the constituents of the fruits, tissues from treated and untreated fruits were analysed for amino acids, amides, sugars and organic acids employing method described by Ranjan and Laloraya (1960). They were also analysed for vitamin C following the method of Ghosh *et al.* (1966). The constituents of treated fruits were compared.

The organoleptic test of treated and untreated fruits was performed in order to record the changes, if any, in the palatability of fruits due to treatment.

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Table 1: Loss in treated and untreated fruits of apple, tomato, guava, mango and banana during storage for 7 days and economics of the treatment.

Fruits/Treatments		Fruits stored (kg/dozen)	Cost of fruits (Rs.)	Healthy fruits after storage	Fruits saved by treatments	Cost of fruits saved by treatments	Expenses on treatments (Drug + soap) (Rs.)	Profit due to treatments (Rs.)
Apple								
Asvagandh 200	Control	20 kg	320/-	5.2				
	Treated	20 kg	@ 16 per kg	14.8 kg	9.6 kg	153/-	10/-	143/-
Tomato								
Asvagandh 200	Control	20 kg	12-/-	6.5 kg				
	Treated	20 kg	@ per kg	15.7 kg	9.2 kg	55/-	10/-	45/-
Guava								
Lycopodium	control	20 kg	10/-	4.8 kg				
clavatum 136	Treated	20 kg	@6 per kg	10.4 kg	5.6 kg	33/-	10/-	23/-
Mango								
Lycopoium	Control	20 kg	160/-	6.4 kg				
clavatum 142	Treated	20 kg	@ 8 per kg	15.6 kg	9.2 kg	72/-	10/-	62/-
Banana								
Kali	Control	10 doz	80/-	0				
iodatum 149	Treated	10 doz	@ 8 per doz	4 doz	32/	10/-	22/-	

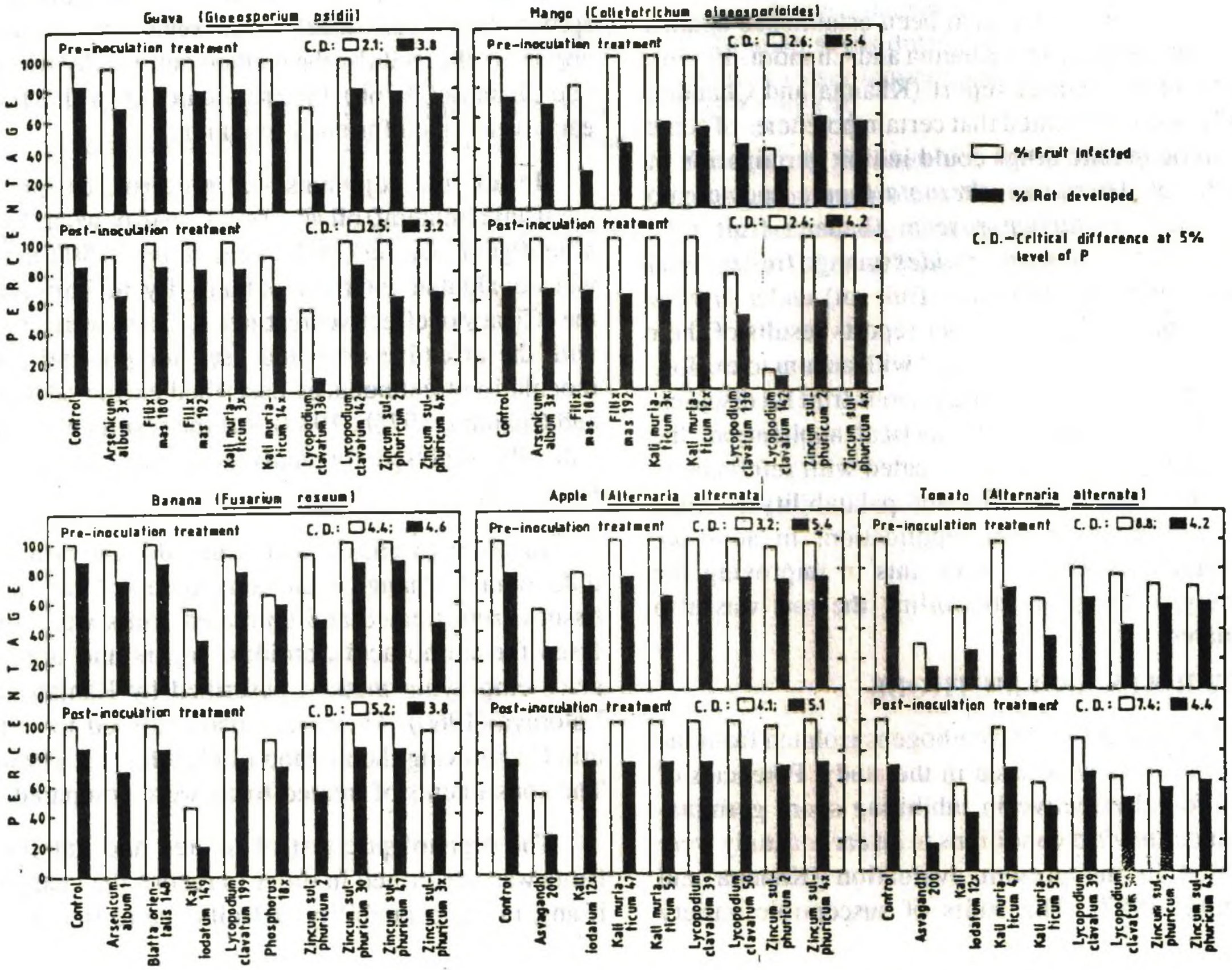

Figure 1. Efficacy of various homoeopathic drugs in checking guava (*Gloeosporium psidii*), mango (*Colletotrichum gloeosporioides*), banana (*Fusarium roseum*), apple (*Alternaria alternata*) and tomato (*Alternaria alternata*) fruit rots.

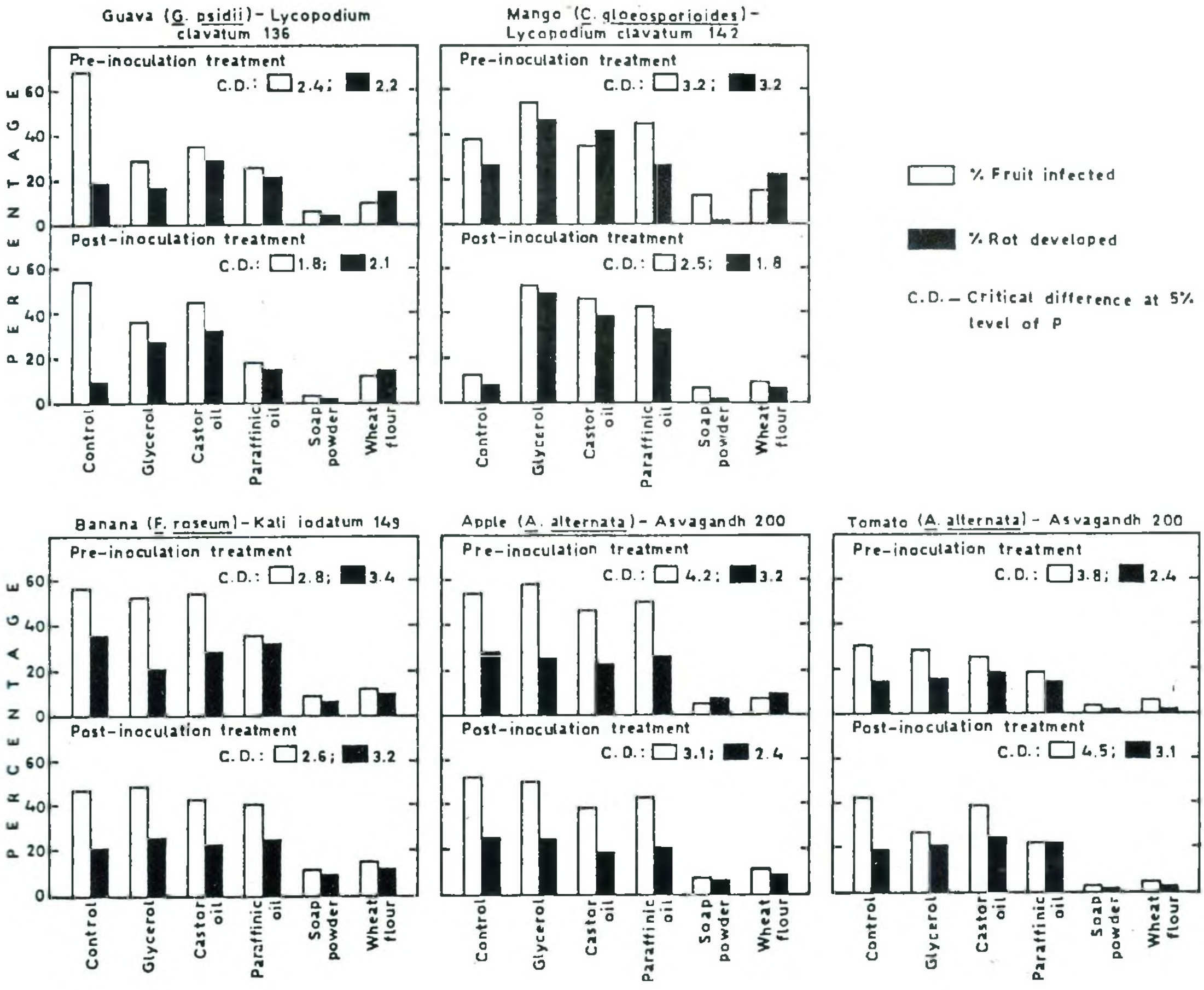

Figure 2. Effect of different adjuvants on the potentiality of most efficacious drug treatments in controlling various fruit rots (Lycopodium clavatum 136 for guava fruit rot caused by *G. psidii*, Lycopodium clavatum 142 for mango fruit rot caused by *C. gloeosporioides*, Kali iodatum 149 for banana fruit rot caused by *F. roseum*, Asvagandh 200 for apple and tomato fruit rots caused by *A. alternata*).

for the purpose, a panel of five healthy persons was constituted and their version on the taste of treated and untreated fruits was taken into account. Economics of the treatment was computed on the basis of cost and benefit ratio (Khanna and Chandra, 1989).

RESULTS AND DISCUSSION

It is evident from the results (Fig. 1) that all the treatments which were effective under *in vitro* condition did not perform well under *in vivo* condition. Only selected few were effective in causing a significant reduction in the percentage of infection and rotting of fruits in different diseases.

Pre-as well as post-inoculation treatments with Asvagandh 200 were most effective in controlling the percentage infection and rotting of fruits in case of fruits rot of apple due to *A. alternata.* The treatments with Asvagandh 200 were effective also for the rotting of tomato fruits caused by *A. altenata.* Out of a number of treatments tested against *F roseum* causing banana fruit rot, pre- and post-inoculation treatment with only Kali iodatum 149 provided maximum reduction in the percentage of fruits infected and rotting developed. Majority of treatments employed could not check the fruit rot of guava caused by *G. psidii* effectively. Only Lycopoduum clavatum 136 could give a significant reduction in the percentage infection as well as rotting in both pre-and post-inoculation treatments. For mango fruit rot caused by *C. gloeosporioides* Lycopodium clavatum 142 was most effective and caused signifi-

cant reduction in percentage infection and rotting in both the types of treatment.

Out of five adjuvants tested (Fig.2), soap powder proved to be highly effective as it enhanced the potentiality of all the efficacious treatments. Wheat flour was also effective but comparatively to a lesser extent. Other adjuvants were either ineffective or decreased the efficacy of the drug by enhancing the percentage of fruit infected and rot developed. The role of adjuvants in improving the potentiality of pre- and post-inoculation treatments is well documented (Harding and Schade, 19767, Solet *et al.*, 1972, Erwin *et al.*, 1974).

Both treated and untreated fruits showed the presence of a variety of sugars (glucose, fructose, sucrose and maltose), organic acids (citric, malic, malonic, succinic, fumaric and tartaric), amino acids/ amides (leucine, isoleucine, valine, Y-amino-n-butyric acid, a-alanine, glutanic acid, arginine, aspartic acid, serine, glycine, asparagine, cysteine, histidine, lysine, proline and threonine) and vitamin C in their tissue. Minor quantitative differences were recorded in the pool of sugars, organic acids, amino acids and vitamin C in the healthy fruits of mango, guava, apple, tomato and banana. The treatments did not cause any appreciable change in this pool. The findings are in conformity with an earlier report by Khanna and Chandra (1989).

The organoleptic test indicated that none of the treatments caused any change in the taste of the fruits and they retained their palatability even after treatment. With regards to the practical application of the treatments, this finding is of great significance.

The results presented in table 1 indicate that the treatments caused a marked reduction in the losses of fruits during storage. During seven days storage, the untreated fruits of guava, mango, tomato and apple incurred a loss of 67.5 to 76/0% while the treated fruits incurred a loss of only 21.5 to 48.0%. In banana, the treated fruits incurred 100% loss while the treated ones incurred a loss of only 60%. Calculations of cost and benefit indicated the treatments to be highly profitable in all the cases.

It may be safely concluded from the findings of present study that the treatment of the fruits for the storage diseases is not only highly effective but also economical. Since the treatment has no effect on the constitution and palatability of the fruits, it may be recommended for the control of storage rot of the fruits.

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