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The impact of citrus sinensis rind as Urban Waste, components on the field performance of pulses

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Abstract
The effect of *Citrus sinensis* rind has been studied on germination and seedling growth of six pulses. Presence of rind pieces caused 8-15 percent loss in seed germination, very appreciable retardation of radicle and little growth in case of plumules of the pulse seedling. Significant suppression of radicle growth was also recorded in all cases except in Pigeon pea and Lentil. The aromatic substances present in the rind may he responsible for the inhibitory action.

Keywords: citrus sinensis, Urban Waste, performance of pulses

1. Introduction
Various plants are known to possess certain chemical substances which when exuded on the surface, often adversely effect the growth of other plants (Bonner, 1980; Srivastava, 1969; Rice, 1974; Sarma, 1974; Sen, 1977 and Ashraf and Sen, 1998) [3, 5]. Weathering-leaching, exudation and volatilization are believed to be the modes of their liberation from different parts (Whittaker, 1970).
The present study is an attempt to find out the possible effect of fresh Mausami rind which contain oil glands and citric acid, on the seed germination seedling growth and biomass of said pulses. The rinds are almost regularly encountered in urban waste which is used as fertilizer by marginal farmers. The likely impact of this waste component on the productivity of the pulses was therefore probed and the results presented herein.

2. Materials and Methods
Ten gram fresh Mausami rind was taken in sterilized petri plates, lined with three layers of sterilized filter papers. The filter papers were moistened regularly with distilled water. These rind pieces were put in the centre of the petri plates, and 25 sterilized seeds (with 0.1% $HgCl_2$) were kept for germination in the periphery of the petri plates. After 8 days incubation at 26 $\pm$ 2°C, percent seed germination, length of plumule and radicle and biomass of the seedlings were recorded. Five petri plates of each pulse seed were employed. Corresponding controls were also maintained.

3. Results and Discussion
The observations listed in Table reveals that the germination of the pulse seeds is not greatly influenced by the presence of rind pieces in petri plates. The difference in treated and control seeds varied between 8-12 percent in black gram, 6-13 percent in green gram, 8-12 percent in broad bean, 8-10 percent in Pigeon pea, 8 percent in Mad bean and 8-12 percent in lentil which may be considered even less than moderate losses.
The field performance of crop seeds is not confined to their germination only. The growth of the seedlings is yet another important aspect in this respect. The present treatment has been proved to be highly deleterious in terms of plumule growth of the pulse seeds under study, with the consequence that this organ has failed to grow beyond the level of testa except in case of Mad bean where 0.5 to 1.0cm length was attained as compared to 3-5cms in control (Table).
The radicle has demonstrated considerable resistance to the influence of C. sinensis rind. While considerable adverse influence was apparent in case of black gram, green gram and Mad bean radicles, it was much lesser in case of broad bean. Pigeon pea and lentil radicles seen to have been stimulated to grow more than even control, thus showing a reverse trend.
The estimate of seedling growth in terms of radicle and plumule length does not reveal the state of seedling health of seedling vigour. Hence the biomass of the seedlings was determined (Table). This parameters brings out the fact that even normal growing seedlings had their vigour appreciably retarded in comparison to the respective controls. The same was applicable to lentil and pigeon pea which demonstrated promotive effect in their radicle growth. A part of this loss in vigour may be attributed to the non-growth of the radicles of most of the pulses under study.

Table 1: Effect of Citrus sinensis rind on Seed Germination, Seedling Growth and Vigour.

Crops	Seed Germination (%)		Length of Plumule (cm)		Length of radicle (cm)		Biomass	
	Control	Treated	Control	Treated	Control	Treated	Control	Treated
1. Black Gram	100	88	16.5	--	6.5	4.5	1.020	0.500
	98	80	14.8	--	8.0	4.0	1.000	0.200
	98	90	16.0	--	8.0	4.0	1.000	0.500
2.Green	96	90	9.8	--	5.0	4.0	0.500	0.100

Gram	98	85	12.0	--	5.0	3.0	0.500	0.080
	96	87	11.0	--	6.0	4.5	0.550	0.080
3.Broad Gram	100	92	5.0	--	5.5	4.0	0.700	0.180
	100	90	7.0	--	8.0	3.5	0.750	0.150
	98	86	4.0	--	6.0	3.0	0.710	0.170
4.Pigeon Gram	100	92	5.5	--	2.5	4.5	0.470	0.200
	100	90	7.0	--	2.5	4.0	0.500	0.170
	100	92	5.0	--	3.0	5.0	0.450	0.180
5. Med Bean	98	90	3.0	0.5	3.0	1.5	0.200	0.120
	98	90	5.0	1.0	2.5	2.0	0.220	0.100
	96	88	3.5	0.7	3.0	1.5	0.250	0.120
6. Lentil	100	90	10.0	--	2.5	4.5	0.150	0.120
	100	88	9.0	--	1.5	3.0	0.180	0.100
	100	90	9.0	--	2.5	4.0	0.200	0.120

Several workers have reported similar inhibitory effects on different crops under the influence of various plant parts. Bhandari and Sen (1971) and Pandya (1975) have also reported toxic effects of the root extracts of *Citrullus colocynthis* and *Ceiosia argentea* respectively on seed germination and seedling growth of crops. Inhibitory factors have also been observed in *Heliotropium eichwoldi* (Srivastava, 1969) and in *Echinops echinatum* and *Solanum surattense* (Sarma, 1974).

The observations thus do point out that the C. *sinensis* rinds have had little inhibitory influence on seed germination of pulses but it greatly retarded the seedling growth and their vigour subject to a few exceptions. The losses may further multiply in fields where the rind is bound to be decomposed and thus release citric acid to the soil, thereby lowering its pH. The components like C. *sinensis* rind may be sorted out from urban waste before using it as manure, if the losses are to be minimized in yield of important food ingredient like pulses.

4. References

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