TABLE I

Name of the species	Pycinidia		Pycnidiospores	
	Shape	Size (μm)	Shape	Size (μm)
P. colocasiicola Höhnel	Globose	100–120	Ovoid	10 × 5–6
P. monsterae sp. nov.	Globose to subglobose	50–90	More or less cylindrical, straight or curved	12·5–14·5 × upto 4·5

appendice addita parata, guttulata, 12·5–14·5 × 4·5 μm.

Infection spots amphigenous, small, circular to irregular, greyish with reddish brown margin; pycnidia epiphyllous, few to many, scattered, immersed, dark brown, globose to subglobose, thick walled, 50–90 μm diam.; ostioles distinct, single per pycinidium, circular, small, with darker and thick walled hyphae along ostiolar region, 10–21·5 μm diam.; conidiogenous cells arising from the cells of inner wall of the pycnidium, elongated, cylindrical, hyaline; conidia solitary, simple, hyaline, smooth, one-celled, numerous, usually more or less cylindrical, straight or curved, with rounded ends, surrounded by a mucilagenous sheath and bearing an extra appendage at apex, guttulate, measuring 12·5–14·5 × upto 4·5 μm (Fig. 1 *a*, *b*).

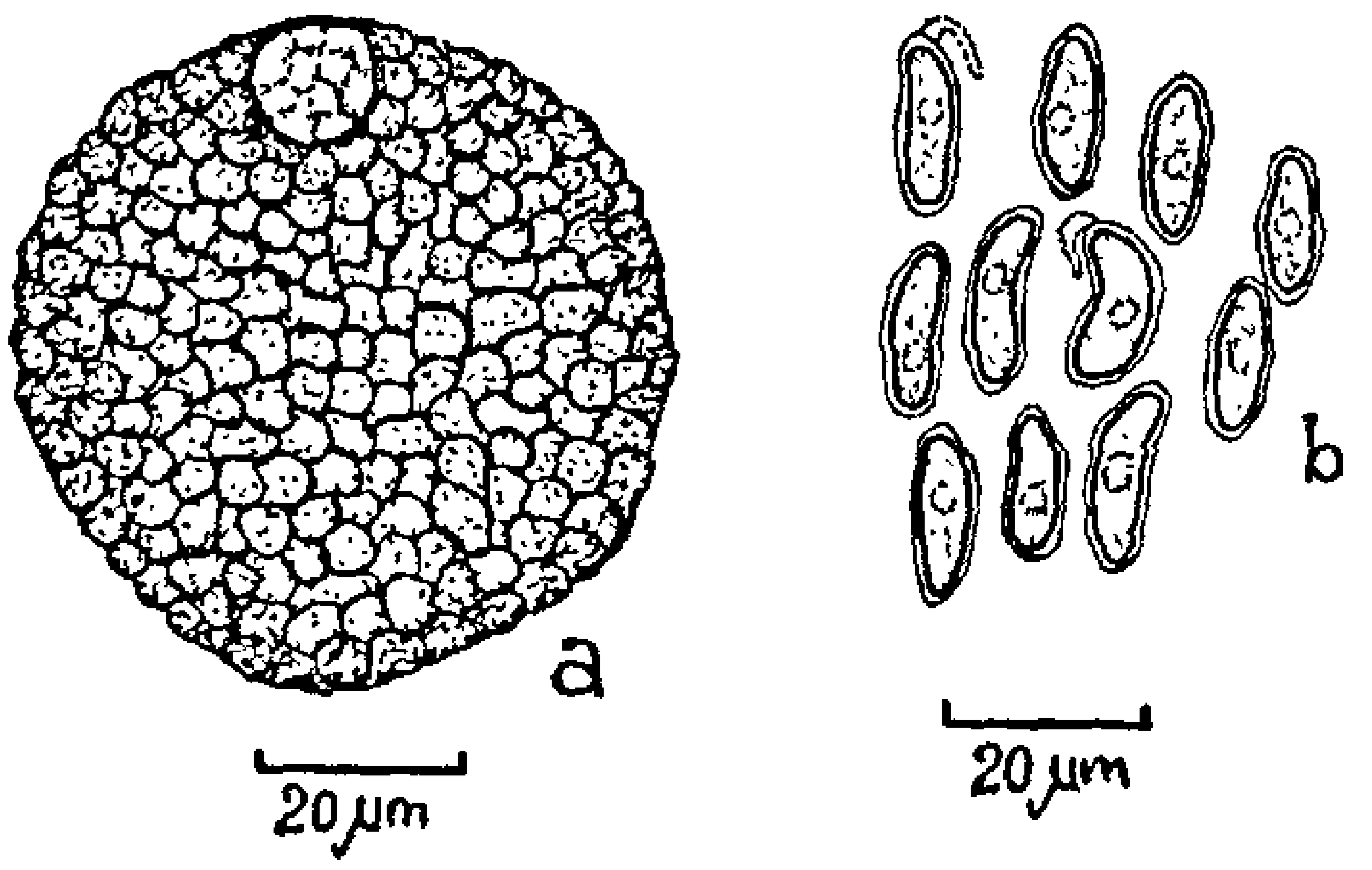

FIG. 1

On living leaves of *Monstera deliciosa* Liebm. Gorakhpur, U.P., April, 1978, Leg. P. Kumar Type (IMI–228176*b*).

The infection appeared fairly widely distributed. Previous literature indicates that no *Phyllosticta* species has ever been described parasitising this host genus. However, the present collection comes close to *Phyllosticta colocasiicola* Höhnel[1] described on *Colocasia*, a different host genus of family Araceae to which the host in question (*Monstera*) belongs. For comparison Table I with morphological features of *Phyllosticta colocasiicola* and *P. monsterae* sp. nov. is presented.

The pycnidia of the present collection are significantly smaller as compared to those in *P. colocasiicola* Höhnel. The pycinidiospores, on the other hand, are larger and narrower in the present species as opposed to *P. colocasiicola*. The shape of pycnidiospores also differs distinctly in the two cases. The present fungus, therefore, merits description, as a new species.

We are grateful to Dr. E. Punithalingam, CMI, for confirming the identity of the fungus. Thanks are due to Prof. S. N. Mathur for providing facilities and to Dr. E. K. Cash, U.S.A., for the Latin diagnosis and also to C.S.I.R., New Delhi, for providing JRF to PK.

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INFLUENCE OF PRESOWING HARDENING ON RESISTANCE TO ALLELOPATHY, DRY MATTER PRODUCTION, CHLOROPHYLL CONTENT AND SENESCENCE IN WHEAT

Introduction

GROWTH inhibitors are reported to get exuded to soil from the root system of many allelopathic weed species and these are found to reduce yield of cultivated crop species significantly[1,3]. Phenolic acids which are prominent amongst these inhibitors are reported to inhibit germination and seedling growth[4].

Hardening seeds with very low concentrations (1–10 ppm) of phenolic acids has been found useful in inducing resistance to allelopathic agents and enhancing productivity in wheat, ragi and tomato (Cowsik and Jayachandra, unpublished).

In the present study the effect of presowing hardening of wheat with phenolic acids on allelopathy, productivity, chlorophyll content and senescence was tested.

Materials and Methods

Wheat (*Triticum aestivum* L.) Var. UP 301 grains obtained from National Seeds Corporation, Bangalore, were hardened with distilled water, caffeic acid (1 ppm), ferulic acid (5 ppm) and vanillic acid (1 ppm).

The hardening treatment consisted of soaking the grains in the respective solutions for 4 hours and drying them to their original weight. The soaking and drying treatment, which was repeated thrice, was given under a fluorescent lamp (5000–7000 Lux). The temperature varied from 22–26° C and the relative humidity ranged between 55–85%.

Test 1 : On allelopathy

To test the influence of hardening on countering the allelopathic effect, seedlings from the hardened and unhardened wheat grains were raised in the rhizosphere soil of *Parthenium hysterophorus* L. which is reported to be strongly allelopathic[3]. 200 g of rhizosphere soil were taken in earthen pots of 10 cm dia. and 15 cm depth in five replications. One set of unhardened grains was also grown in garden soil. 10 day-old seedlings were harvested and their dry weight was determined.

Test 2 : Productivity

Seedlings from the hardened grains as also unhardened were raised in garden soil in earthen pots of 10 cm dia. and 15 cm depth in five replications. 10 day-old plants were used for determining the dry weight of the shoot and root systems.

Test 3 : Chlorophyll content and senescence

Seedlings from hardened and unhardened grains were raised in garden soil in earthen pots of 10 cm dia. and 15 cm depth for 10 days and in pots of 30 cm dia. and 40 cm depth for 20 days.

250 mg of the leaves of 10 and 20 day-old seedlings, in five replications, were extracted in 5 ml acetone. The extract was centrifuged, the supernatant was used for determining chlorophyll content colorimetrically using a red filter.

250 mg of the leaves were cut into small bits and spread on blotters in petridishes (9 cm dia.) moistened with 2·5 ml of distilled water; five replications were maintained in dark for 48 h after which the photosynthetic pigments were extracted as above and the optical density measured as before.

The data were statistically analysed using *t* test. Significance of the treatment values in Test 1 was in comparison with the unhardened grown in rhizosphere soil.

Results and Discussion

Figure 1 shows that presowing hardening helps wheat seedlings in overcoming allelopathic action. The seedlings raised from the unhardened grains suffer an inhibition of 10·76% on the shoot and 19·5% on root. Water hardening was not useful in countering the inhibition in shoot growth, however it could bring down inhibition in root by 7·5%. Hardening with phenolic acids proved much superior to water in that it could annul the allelopathic effect completely.

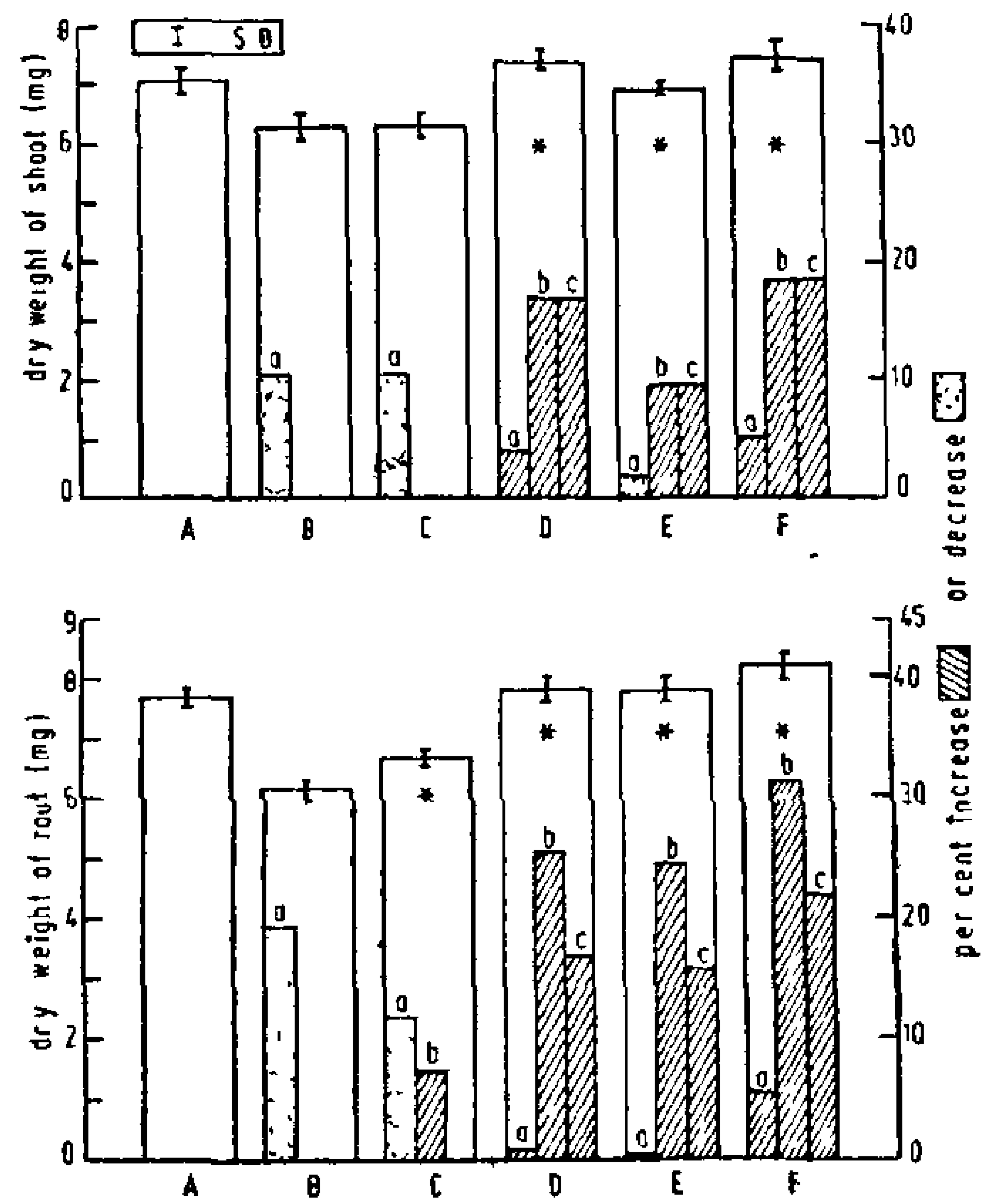

FIG. 1. Effect of hardening with water (C), Caffeic acid (D), ferulic acid (E) and vanillic acid (F) on the growth of 10 day-old seedlings of wheat (*Triticum aestivum* L. var UP 301). in rhizosphere soil of *Parthenium hysterophorus* L.

A and B—Unhardened, A—grown in control soil, B to F—grown in rhizosphere soil.

a, per cent A; *b*, per cent B; *c*, per cent C.

* Significant at 0·01 level.

Figure 2 shows the promoting effect of hardening on the dry matter production in shoots and roots. Water hardening enhances the dry weight of shoot by 10·7% and root by 5·4%. But the different phenolic acid treatments improve the dry weight of the shoot by 8–11% and root by 2–8% more than in the water hardened ones. Seed treatment with many growth retardants like alar, CCC and maleic hydrazide has been reported to increase productivity. Seed soaking

TABLE I

Effect of presowing hardening on chlorophyll content and senescence in the 10 *and* 20 *day-old seedlings of wheat* (Triticum aestivum *L. Var. UP* 301)

Hardening agent	10 days					20 days				
	Initial O.D.	Per cent increase over control	Per cent increase over water hardened	O.D. after 48 h	Per cent decline	Initial O.D.	Per cent increase over control	Per cent increase over water hardened	O.D. after 48 h	Per cent decline
Control (unhardened)	0·44 (0·0)	..	..	0·29 (0·01)	34·1	0·58 (0·01)	..	..	0·38 (0·02)	34·5
Distilled water	0·44 (0·01)	0	..	0·31++ (0·01)	29·6	0·59++	1·7	..	0·41++ (0·01)	30·5
Caffeic acid (1 ppm)	0·47+ (0·02)	4·4	4·4	0·36+ (0·01)	23·4	0·61+ (0·01)	5·2	3·4	0·52+ (0·02)	14·8
Ferulic acid (5 ppm)	0·48+ (0·01)	6·7	6·7	0·35+ (0·01)	27·1	0·61+ (0·01)	5·2	3·4	0·45+ (0·03)	26·2
Vanillic acid (1 ppm)	0·46+ (0·01)	2·2	2·2	0·35+ (0·01)	23·9	0·61+ (0·01)	5·2	3·4	0·47+ (0·02)	23·0

Figures in parentheses refer to standard deviations, +, ++ significant at 0·05 and 0·1 levels respectively.

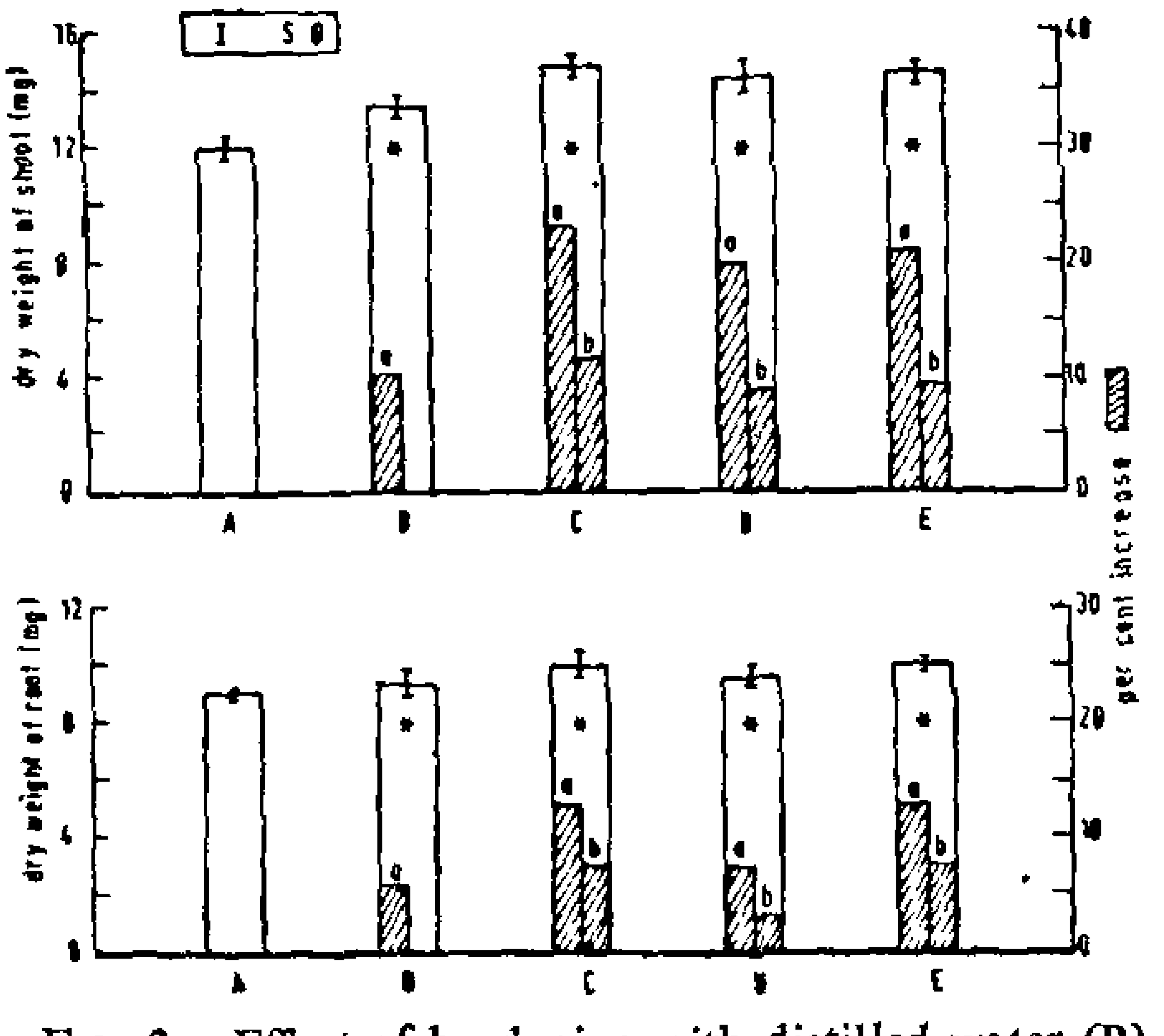

FIG. 2. Effect of hardening with distilled water (B), Caffeic acid (C), ferulic acid (D) and vanillic acid (E) on the dry weight of 10 day-old seedlings of wheat (*Triticum aestivum* L. var. UP 301).

A—Unhardened, *a*, per cent increase over A; *b*, per cent increase over B.

*Significant at 0·05 level.

in tomato with alar and CCC[2] and brinjal with CCC and maleic hydrazide[1] have been of considerable use. The treatments also caused an increase in chlorophyll content (upto 7% in the optical density) at the 10 and 20 day stage. Seeds of onion soaked for 4 hours in 0·11% $CuSO_4$ or $ZnSO_4$ increased the chlorophyll content by 15·4 and 11·5% respectively[5]. When the leaves from 10 and 20 day-old wheat seedlings were allowed to senesce for 48 h, the decline in the chlorophyll content in control was 34·1% and 34·5% respectively. With water hardening the decline was lowered by 4·5%. But in the phenolic acid hardened sample the decline was 2–16% lower than in the water hardened ones (Table I).

Thus, presowing hardening of wheat with 1–5 ppm of phenolic acids is useful in increasing leaf chlorophyll content and productivity and retarding senescence in addition to inducing resistance to allelopathy.

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