Table 2 *Effect of hydration-dehydration on α-amylase activity* of rice seed after accelerated ageing at 100% RH and 40°C for 10 days*

	Starch hydrolyzed/hr in μg			
	Full seed**		Half seed***	
	Without GA	With GA	Without GA	With GA
Cont	80	161	5.9	10.2
SD	125	320	9.3	20.2
MED	122	302	9.0	19.0

* Values expressed as μg of starch hydrolyzed by enzyme equivalent one half-seed.
** Full seed was allowed to sprout without GA (in water) or with GA (5×10^{-6}M) for 48 hr at 25 ± 1°C and then one-half of the seed (embryo-less half) was taken for enzyme extraction.
*** One-half of the dry seed (embryo-less) was incubated for 48 hr at 25 ± 1°C with or without GA (5×10^{-6}M) followed by extraction and assay of enzyme.

fluence on the synthesis of α-amylase in the endosperm. In an earlier study, Mandal and Basu[3] showed that ageing adversely affected the α-amylase synthesis by the aleurone cells of the endosperm.

The present study clearly showed that the hydration-dehydration treatment besides benefiting the embryo, effectively prevented a decline in the functional activity of the aleurone cells of the endosperm during ageing and it resulted a greater α-amylase production by the endosperm and consequent solubilization of the starch reserves and improved nourishment of the embryo transplanted on it.

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THE RECORD OF *CURVULARIA LUNATA* BOEDIJN CAUSING A LEAF-SPOT OF *EUPHORBIA GENICULATA* ORTEG IN POONA.

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Euphorbia geniculata Orteg were found heavily infected with leaf-spot disease in Poona Agricultural College campus during the monsoon season in 1984, the disease appearing in the form of dark brown, round to irregular spots on the leaves.

Isolations made from the lesions on potato-dextrose agar medium at 28 ± 1°C, yielded a species of *Curvularia* Boedijn. Hyphae, was well-developed, branched, septate, sub-hyaline to dark brown; Conidiophores brown except towards the tip where they are paler, simple, unbranched, septate, 3–6 μ broad and variable in length, geniculate towards the tip. Conidia, boat-shaped, brown, 3-septate, the third cell from the base conspicuously larger, broader and darker, curved or some times straight, each with a sub-hyaline rounded apical cell bearing a scar indicating the point of attachment to the conidiophore, 22.5 × 9.5 μ (19.0–26.3 × 7.6–11.4 μ).

All the characters given above agree well with those of *Curvularia lunata*[1,2].

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BACILLUS SUBTILIS AS ANTAGONIST TO VASCULAR WILT PATHOGENS

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Decline in disease incidence with the introduction of *Bacillus subtilis* into the soil, aerial spray or as seed treatment, has been reported for varied groups of fungal plant diseases[1–4]. This soil-inhabiting bacterium holds great promise in the biological control of plant diseases, especially wilt diseases which, with the exception of wilt diseases of woody plants, have their origin in the soil. The use of systemic fungicides and soil fumigation have their well-known drawbacks in the control of vascular pathogens[5] and, therefore, biological control can provide a safe and reliable alternative in the control of wilt diseases.

In the present study antagonistic effect of the two isolates of *B. subtilis* on some important wilt pathogens *viz. Verticillium albo-atrum* Reinke & Berth causing cucurbit wilt, *V. dahliae* Kleb. (tomato wilt), *Fusarium udum* Butler (pigeon pea wilt, isolate (1), *F. udum* Butler (pigeon pea wilt) isolate (2), *F. oxysporum* f. sp. *vasinfectum* (Atk.) Snyder and Hansen (cotton wilt), *F. oxysporum f.* sp. *lycopersici* (Sacc.) Snyder and Hansen (tomato wilt), *Ophiostoma ulmi* Schwartz (= *Ceratocystis ulmi*, (Buism) Moreau), (Dutch elm disease), *Pseudomonas solanacearum* Smith (potato wilt) was tested. The antagonistic bacteria were isolated from soil and identified as *B. subtilis*[6]. Authentic cultures of *B. subtilis* were procured from Dr R. S. Utkhede (Agrl. Can. Res. Stn., British Columbia, Canada) for purpose of comparison with our isolates during identification. The inhibitory effect of the *B. subtilis* isolates on fungal pathogens was studied in dual culture tests[2] run in triplicate. With *P. solanacearum* the antagonism was studied by an over-layer technique[7]. Appropriate optimized pH and temperature were maintained for individual pathogenic strains. Observations were recorded after seven days of incubation for fungal cultures and after three days for the bacterium.

The results (table 1) showed that the two isolates of *B. subtilis* (designated as AF_1 and AF_2), while appreciably inhibited the growth of all test fungal pathogens, were ineffective with *P. solanacearum*. The behaviour of *P. solanacearum* is not surprising as this organism is reported to be resistant to several antibiotics[8]. Isolate AF_1 caused relatively wider zones of inhibition.

Table 1 *Width of inhibition zone (mm) between vascular wilt pathogens and isolates of Bacillus subtilis*

Isolates of wilt pathogens	Isolates of *B. subtilis* AF_1	AF_2
Verticillium albo-atrum	62	60
V. dahliae	60	56
Fusarium udum (isolate. 1)	64	59
F. udum (isolate. 2)	68	67
F. oxysporum f. sp. *lycopersici*	56	54
F. oxysporum f. sp. *vasinfectum*	58	57
Ophiostoma ulmi (= *Ceratocystis ulmi*)	54	54
Pseudomonas solanacearum	No inhibition	

B. subtilis has earlier been reported to be antagonistic to *Phytophthora cactorum*[1], *Sclerotium cepivorum*[2], *Uromyces phaseoli*[3], *Rhizoctonia solani*[4], *F. oxysporum* f. sp *udum*[9], and some fungal pathogens of citrus fruit[10], and has been successfully used in the control of diseases caused by them. Stable amendment of wilt-sick soil with antagonistic microbes like the present isolates of *B. subtilis* may provide an ideal biological control of fungal wilt diseases, which in spite of about hundred years of research continue to take a heavy toll of important crop plants all over the world.

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