Table 2. Typability for five enzymes in hair sheath of cadavers stored at room temperature.

		No. of samples* positive after storage for days										
Enzyme	Phenotype	1–7	8–11	12–15	16–18	19–21	22–24	25–27	28–31	32–33	34–35	36–37
PGM	1–1	53	53	53	53	50	42	32	21	16	7	—
	2–1	35	35	35	35	31	26	18	11	6	1	—
	2–2	15	15	15	15	14	9	3	—	—	—	—
EsD	1–1	62	62	62	61	61	58	51	43	40	33	21
	2–1	36	36	36	35	34	30	23	18	16	11	3
	2–2	5	5	5	5	5	3	1	—	—	—	—
AP	p^{a+b-}	13	13	13	13	12	7	4	2	1	1	—
	p^{a+b+}	42	42	42	41	40	35	31	21	14	7	2
	p^{a-b+}	48	48	48	45	43	36	33	26	18	11	4
GLO-I	1–1	8	8	8	7	5	1	—	—	—	—	—
	2–1	39	39	39	32	27	18	11	3	—	—	—
	2–2	56	56	56	46	40	26	17	7	—	—	—
PGI	1–1	101	101	101	97	90	81	72	67	51	39	22
	3–1	2	2	2	—	—	—	—	—	—	—	—

*Total number of samples tested, 103.

hair sheath samples are given Table 2. Samples were typable for PGM for up to 18 days, after which more and more samples known to be positive for a given phenotype typed negative. Several workers have studied activity of PGM in hair. Oya *et al.*[3] reported activity of PGM for up to 14 days on starch gels, while Yoshida *et al.*[5] detected it for up to 10 days on the same medium.

The variants of both EsD and AP were detected in stored samples for up to 15 days, but the intensity of the bands started to decrease after 13 days. In an earlier study on a Japanese population, Yoshida *et al.*[5] detected EsD for only up to 4 days.

GLO-I was detected for up to 15 days. Stability of GLO-I for up to 7 days, using cellogel membranes, has been reported earlier[13].

In the case of PGI, high frequency of the *PGI1* allele has been reported. We did not find any rare variant other than *PGI3*. Both were detectable for up to 15 days.

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31 March 1989

Synergistic oviposition deterrence activity of extracts of *Glycosmis pentaphyllum* (Rutaceae) and other plants for *Phthorimaea operculella* (Zell) control

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Acetone extracts of *Glycosmis pentaphyllum* combined with equal amounts of extracts of *Catharanthus roseus*, Neemrich, *Salvadora oleododes*, *Breneya* species exhibited significant increase in ovipositional deterrence activity against *Phthorimaea operculella* compared to the activity of the individual extracts. Important practical implications are adduced for such synergistic enhancement of bioactivity by combinations of plant extractives.

USEFULNESS of natural compounds in insect control has been emphasized recently[1]. Extracts of naturally occurring plants have been assessed for their attractant, repellent, insecticidal, hormonal and behavioural activities against insects. New pest control strategies based on such programmes are being constantly developed[2]. Insect oviposition can be deterred by chemical or other stimuli having tendency to increase locomotor activity[3]. Acetone extracts of the *Glycosmis pentaphyllum* (Rutaceae) exhibit various insectistatic properties[4]. Two important activities from this plant are antifeedant action and oviposition deterrence (OD) against various insects of

Table 1. Synergistic ovipositional deterrence activity of extracts of *Glycosmis pentaphyllum* and other plants.

Compound	Dose (mg cm^{-2}) 5	2	1
G. pentaphyllum	20	14	10
Neemrich I	20	18	10
G. pentaphyllum + Neemrich I	35	30	15
S. oledodes	20	16	12
G. pentaphyllum + *S. oledodes*	45	38	30
C. roseus	5	3	2
G. pentaphyllum + *C. roseus*	10	6	2
Breneya sp.	10	4	2
G. pentaphyllum + *Breneya* sp.	15	5	2

*Day's persistence of 100% action.

agricultural and public health importance. Extracts of different plants such as *Catharanthus roseus*, Neemrich I[5], *Salvadora oleododes and Breneya* species were combined with *G. pentaphyllum* extract to study synergistic effects on OD activity against the potato tuber moth (PTM). Procedures standardized earlier[6] were used to determine persistence and nature of OD activity against PTM.

OD activity against the PTM adults was measured by length of persistence of 100% oviposition inhibition on a preferred substrate treated with desired doses of the plant extracts. The latter were used singly and in various combinations (Table 1). *G. pentaphyllum* gave maximum 100% OD activity at 5 mg cm^{-2} dose which persisted for 20 days. At lower doses (2.5 mg cm^{-2} and 1 mg cm^{-2}) the persistence level decreased. The same activity was also obtained in Neemrich I and *S. oleododes*. *C. roseus* and *Breneya* sp. did not exhibit any significant activity at 5 mg cm^{-2}. Combination of plant extracts, viz. *G. pentaphyllum* with Neemrich I, *S. oleododes*, *C. roseus*, and *Breneya* sp. in simple 1 : 1 ratio yielded significant increase in OD activity (Table 1). The combination *G. pentaphyllum* + Neemrich I showed double the persistence obtained with *G. pentaphyllum* alone at both high and low doses. Enhancement of OD activity was also obtained with combinations of *G. pentaphyllum* and *S. oleododes* at all doses. However, combinations of *G. pentaphyllum* with *C. roseus* and *G. pentaphyllum* with *Breneya* sp. exhibited only marginal increase in activity at all doses.

From the foregoing, it is apparent that combination of some plant extracts in appropriate proportions induces synergistic enchancement of OD activity at even half or lesser dose. This phenomenon can have important implications in the practical application of natural products for pest management.

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1 February 1990

Occurrence of phosphate-solubilizing bacteria in the endorhizosphere of crop plants

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Plant roots examined harboured phosphate-solubilizing bacteria in the endorhizosphere, with *Beta vulgaris* harbouring the highest population.

ENDORHIZOSPHERE refers to the root interior, including the epidermis–cortex region[1]. The presence of bacteria in this region capable of fixing atmospheric nitrogen and production of growth regulators is well known. It is possible that these roots also harbour other types of beneficial bacteria. Hence the present study was conducted to explore the possibility of the presence of phosphate-solubilizing bacteria in the endorhizosphere of different crops.

The method followed was essentially the same as described by Watanabe *et al.*[2] Ten grams of the root sample was transferred into a 250 ml conical flask containing 100 ml of sterile distilled water and 5 g of glass beads. The roots were washed by shaking for 5 min. The washed water was decanted and fresh 100 ml sterile water was added. The washings were repeated ten times to remove all the soil particles and micro-organisms present on the root surface. The washed roots were transferred under aseptic conditions to a mortar which was previously sterilized with 70% alcohol, flamed and cooled. The roots were cut aseptically into small pieces (2–3 cm), macerated and serially diluted. The appropriate dilution was plated on Tryptic soy agar medium (Difco) and hydroxyapatite agar medium[3] to enumerate the total bacterial and total phosphate-solubilizing bacterial population respectively.