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EFFECT OF DOMESTIC WASTES ON THE GERMINATION OF MAIZE AND COWPEA SEEDS

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The mean difference between the effect of control and that of the domestic wastes is sighificant (P>0.01) with respect to germination of maize and cowpea seeds. Whey, papaya peel, orange residue and cowdung proved to be the best for germination of maize followed by cowpea. The rate of germination was also higher due to the treatment of wastes. Amylase activity in cowpea seed was highest due to cowdung, that of starch phosphorylase due to whey and protease due to papaya peel. In maize amylase and starch phosphorylase were highest due to whey. Starch and protein content in the endosperm of maize and cotyledons of cowpea gradually decreased with more rapid speed due to the treatment of waste than the untreated control after germination.

Keywords : Cowpea seeds; Domestic wastes; Germination; Hydrolyzing enzymes; Maize seeds; Protein; Starch.

Beneficial effects of seed treatments with chemicals and growth hormones have been observed [1-3]. In the present paper effect of some domestic wastes have been studied on the germination of maize and cowpea seeds besides assaying the activity of enzymes related with hydrolysis of reserve food of the seeds. Starch and protein content in the endosperm of maize and cotyledons of cowpea seed were also estimated during germination.

Seeds of maize (*Zea mays* L) var. Ganga Safed 2 having 63.3% germination and cowpea (*Vigna unguiculata* L) Wasp var. Pusa Falguni having 56.6% germination were procured from the farmers. Whey, papaya peel and orange residue, all being fully treated as domestic wastes and cowdung were used to see their effect on germination after pre-treatments forehand of their use.

Whey : One litre of cow's milk was boiled with 200 ml of confectioner's whey (sour), cooled on curdling and filtered with four layers of prewashed cheese cloth. The pH was adjusted to 7 with the help of 0.5 N sodium hydroxide and stored at 2°C.

Papaya peel and orange residue : The peel of ripe papaya and orange residue left over after extracting the juice by squeezer were procured from fruit stall. 500g of these were separately blended each with 1 litre of tap water and filtered as for whey and pH was adjusted to 7 and stored as above.

Cowdung : Two hundred and fifty g of fresh cowdung was stirred with 1 litre of tap water and filtered and stored as for papaya peel.

Soaking of the seeds : One hundred seeds were soaked for 18 hr separately in 200 ml of the processed wastes at 10°C taking them in plastic mugs. The open mouth of the mug was covered with polyethylene sheets. The content of the mug was shaken at an interval of 3 hr with glass rod to maintain homogenity of the wastes.

Setting the seeds for germination : The seeds soaked as above were set for germination after washing with tap water taking 10 seds per moist blotter in ten replicates. These were maintained at 30±0.5°C for six days in diffused light of 5000 lux. Control was maintained of the seeds soaked only in tap water. The record of per cent germination besides the rate of germination was calculated[4].

Assaying the activity of hydrolyzing enzymes : Seeds were set for germination as noted

Table 1. Germination (%) and rate of germination of maize and cowpea seeds due to treatment with wastes.

		Wastes				
		Cowdung	Whey	Papaya peel	Orange residue	Control
Germination	Maize Seeds	76.6	85.0	70.6	76.6	63.3
	Cowpea Seeds	56.6	78.6	63.3	63.3	56.6
Rate of germination	Maize Seeds	18.52	17.93	18.28	19.74	16.06
	Cowpea Seeds	21.54	20.36	21.62	22.53	16.88
CD = 6.06 (P>0.01)						

earlier and activity of amylase[5] and starch phosphorylase[6] were assayed in both the crop seeds while protease was assayed[5] in cowpea seed only on the 4th day of setting for germination.

Estimation of starch and protein : Starch was estimated[7] in the endosperm of maize and cotyledons of cowpea continuously for four days just after germination. Protein (%) was calculated after estimating nitrogen with the help of Coleman N_2 analyser and multiplying the value with 6.25.

The mean difference between the effect of control and that of the domestic wastes is significant (P>0.01). All the four wastes proved the best for maize followed by cowpea (Table 1). The rate of germination of seeds was higher due to the effect of wastes (Table 1).

The activity of amylase in cowpea seed was highest due to cowdung, that of starch phosphorylase due to whey and protease due to papaya peel. In maize amylase and starch phosphorylase activities were highest due to whey (Fig. 1).

The enhanced germination percentage and the rate due to treatment of seeds with wastes indicate their beneficial effect on some or all armary of physiological processes leading to the germination of seeds. Better performance of the wastes might be due to having rich amount of minerals, sugars, amino acids, soluble proteins, other organic acids and vitamins affecting the seeds favourably at their germination.

The hydrolysis of stored food materials of the seed begins with the inbibition and continues to the time the plumule synthesizes its own food[8]. Sugars and amino acids are simple hydrolytic product of the reserve food to come in the chain of reactions leading to the germination of seeds. Their availability at the active site of cell division which is pre-requisite of germination, is essential. Amylase and starch phosphorylase besides other enzymes have been implicated in starch hydrolysis in seed[9]. Decrease in starch and protein content was more in endosperm and cotyledon of maize and cowpea seeds treated with the wastes than the control (Fig 3) indicates repid hydrolysis of reserve food expectedly supplying more food to the young seedlings for better growth and vigour.

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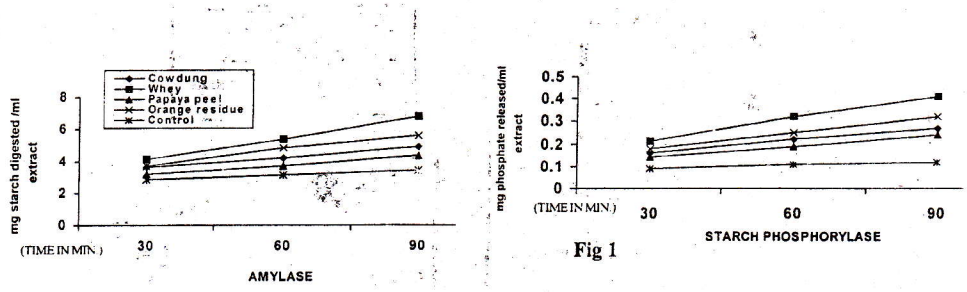

Fig 1

Fig. 1. Amylase (expressed as mg starch digested) and starch phosphorylase (mg phosphate released) activity in maize seeds after treatment with the wastes.

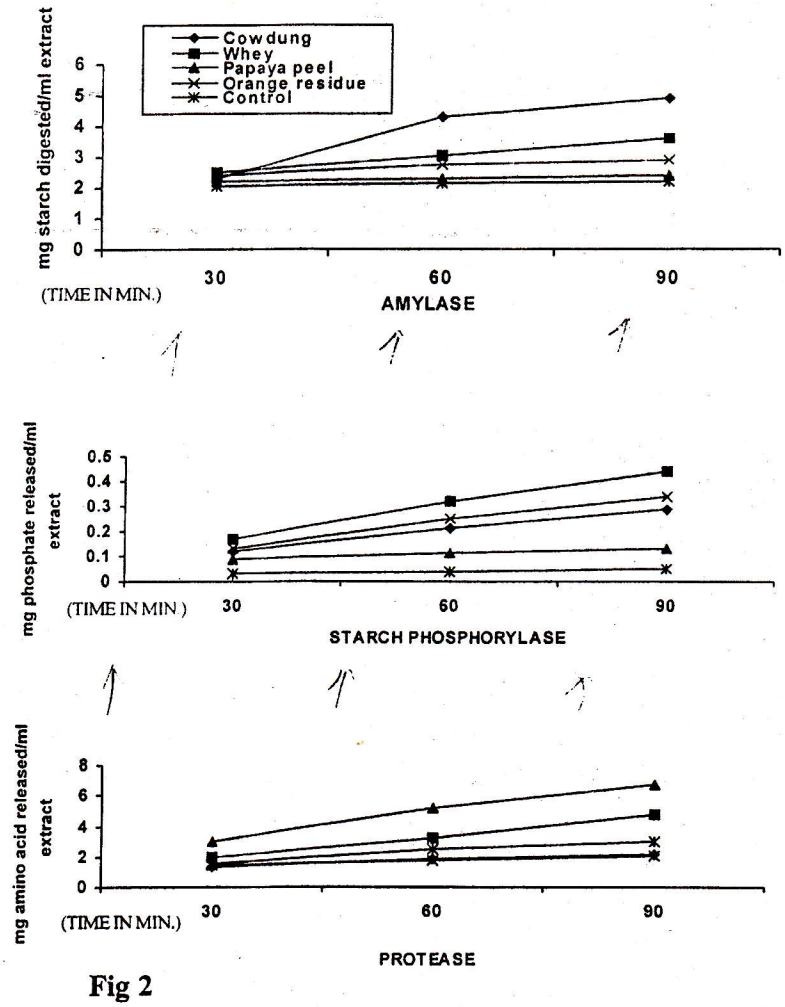

Fig 2

Fig. 2. Amylase (expressed as mg starch digested), starch phosphorylase (mg phosphate released) and protease (expressed as mg amino acid released) activity in cowpea seeds after treatment with the wastes.

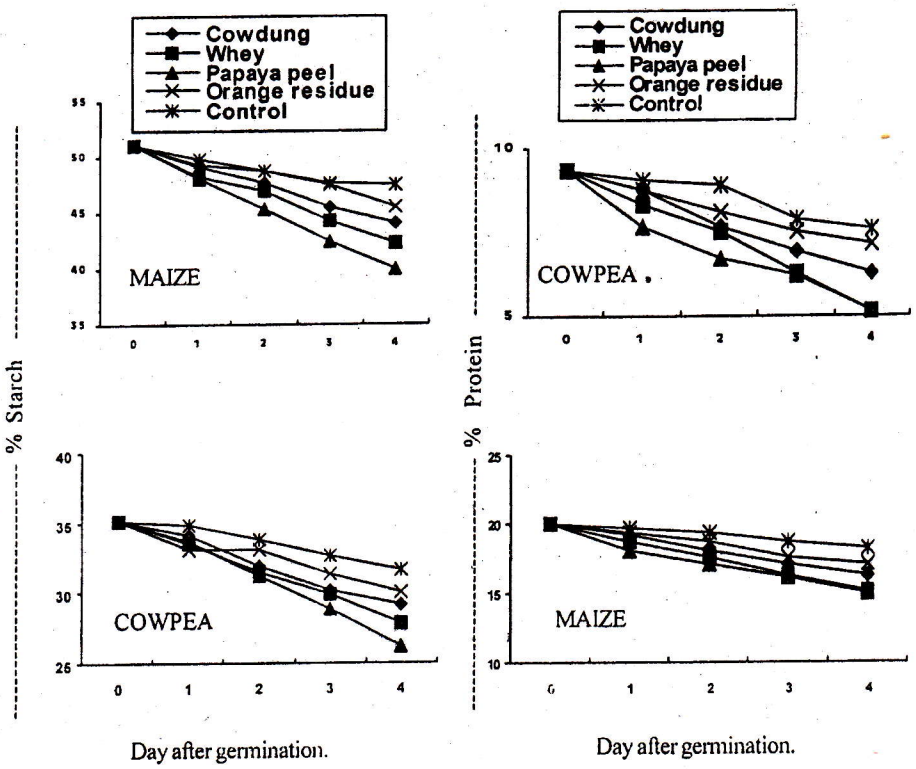

Fig 3

Fig. 3. Percent starch content in the endosperm of maize and cotyledons of cowpea during seed germination due to treatment with wastes. Percent protein content in the endosperm of maize and cotyledons of cowpea during seed germination due to treatment with wastes.

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