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Short Communication

Effect of Mechanical Processing on Health Status of Some Vegetable Seeds

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Seed surface play an important role in harbouring microbes, which cause damage to the seed and affect its planting value. Seed mycoflora are responsible for deterioration of seed health and quality [1,2]. The physical damage caused to the seed during harvesting and threshing facilitate easy entry of the microbes that cause damage to the seed in the form of distortions, discolourations, alteration in seed size or shrivelledness, thereby lowering its quality. Higher initial contamination and inadequate processing lead to seed deterioration during storage [3]. Seed processing is an essential step to ensure removal of undesirable impurities from the harvest and to ensure maximum recovery of quality seed [4]. The information on the effect of mechanical processing on the health status of seeds is very scanty, hence present study was undertaken.

Seed samples of tomato (Pusa Ruby), carrot (Pusa Kesar), cauliflower (Early Synthetic) and onion (Pusa Red) were collected after harvesting and dried to reduce the moisture content to below 7.0 per cent. One half of these seeds were processed by screen cleaner-cum-grader followed by specific-gravity-separator. Seeds from both unprocessed and processed seed lots were subjected to seed health tests using standard blotter method. In tomato, carrot and onion the germination percentage of unprocessed and processed seeds was evaluated by paper towel method [5].

Twelve fungi were found associated with vegetable seeds (Table 1). In general, higher incidence of mycoflora was found associated with unprocessed seeds than with processed seed lots.

In tomato (Pusa Ruby) majority of the seeds were clean and free from any symptoms and hence exhibited uniformity in appearance, colour and germination. After mechanical processing the incidence of *Aspergillus flavus* was unrecordable and that of *Alternaria alternata* reduced to negligible level of 1.0 per cent on the seeds. This is attributed to physical removal of the infected seeds by mechanical processing and thus reducing their presence in the processed seed lots. However, *Fusarium semitectum* surfaced after processing. It appears that the fungus was hidden inside the seed coat, which surfaced during the period after first observation. The germination of tomato seeds increased from 94.7 to 98.7 per cent (Table 1) after processing.

The mechanical processing of carrot seeds (Pusa Kesar) reduced the associated mycoflora from 90 to 53. The unprocessed seeds carried a heavy infestation of *Alternaria alternata* (84%), which got reduced to 43 per cent after processing. In general, the highly infested seeds showed poor germinability. The mechanical processing reduced the incidence of *Stemphylium* sp. by one per cent. However, the incidence of *A. dauci*, a seed borne pathogen in carrot, remained unaffected due to processing. Fungi like *Curvularia lunata, Drechslera* sp. and *Cladosporium* sp. were observed associated with the processed seeds only. Perhaps the very limited growth of these fungi on the unprocessed

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seeds got obscured and could not be detected due to profuse growth of other fungi. The various microorganisms present on the seed interact within themselves. This interaction may often be antagonistic thereby affecting the ability of individual microbes to develop and grow. Simple processing is reported to drastically and effectively decrease the associated microbial populations on pepper samples [6]. Higher germination was observed in mechanically processed seeds (79.0%) as against 70.0 per cent in unprocessed seeds of carrot (Table 1).

In cauliflower (Early Synthetic) mechanical processing reduced the incidence of the pathogen *Alternaria brassicicola* from 50 to 45 per cent and of *A. alternata* from 22 to 8 per cent. As in tomato and carrot seeds, fungi like *Fusarium semitectum*, *C. lunata*, *Cladosporium* sp. and *Penicillium* sp. were found associated only with processed seeds of cauliflower due to the identical reasons. In most of the severely infected seeds the seed coat was fully covered with black fungal growth and hence they did not germinate. In some cases the seeds germinated but the seedlings remained stunted.

In onion (Pusa Red) the incidence of mycoflora associated with mechanically processed seed was 37 as against 57 fungi found with unprocessed seeds. A high incidence of *Aspergillus flavus* (28%) was recorded on unprocessed seed, which got reduced to 8 per cent after processing. The fungi *A. alternata* and *C. lunata* were completely eliminated and the incidence of *Aspergillus niger* and *Rhizopus* sp. got reduced from 14 to 11 and 11 to 9 per cent, respectively. However, the incidence

Table 1. Association of fungi in unprocessed and processed vegetable seeds of different crops

Fungi	Fungal incidence/100 seeds in different crops							
	Tomato (P. Ruby)		Carrot (P. Kesar)		Cauliflower (Early Synthetic)		Onion (P. Red)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Germination (%)	94	98	70	79	-	-	89	98
Alternaria alternata	3	1	84	43	22	8	2	-
A. dauci	-	-	1	1	-	-	-	-
A. brassicicola	-	-	-	-	50	45	-	-
Fusarium semitectum	-	1	-	-	-	10	-	-
Stemphylium sp.	-	-	5	4	-	-	-	-
Curvularia lunata	-	-	-	2	-	3	1	-
Drechslera sp.	-	-	-	2	-	-	-	-
Cladosporium sp.	-	-	-	1	-	3	-	-
Penicillium sp.	-	-	-	-	-	1	1	9
Aspergillus flavus	1	-	-	-	-	-	28	8
Rhizopus sp.	-	-	-	-	-	-	11	9
Aspergillus niger	-	-	-	-	-	-	14	11
Total	4	2	90	53	72	70	57	37

(1) = unprocessed seed; (2) = processed seed; (-) = not found.

of *Penicillium* sp. increased from 1 to 9 per cent after processing due to reasons discussed earlier. The processing of onion seeds also enhanced seed germination from 89.3 to 98.7 per cent (Table 1).

Thus, the per cent incidence of most fungi as *A. alternata, A. brassicicola, Stemphylium* and *Aspergillus niger* was high on unprocessed seeds but their incidence got reduced by 30 to 60 per cent after processing. The overall reduction in mycoflora is attributed to the physical removal of disease-affected seeds during processing. It appears that majority of mycoflora carrying seeds are either undersized or low-density seeds. Undersized seeds are removed in mechanical seed cleaning and screen grading and low-density seeds are air lifted in air screen-cleaner cum grader and further skimmed off in specific gravity separation. Processing is important to recover healthy seed in crops affected by a disease in the field and to prevent fungal activity during storage. Loiveke *et al.* [7] had concluded that the multitude of fungal flora on grains/feeds is an indication of possible agro-technical mistake at growth stage or post harvest treatments before storage or during storage. This can be avoided by proper care of the crop in pre-harvest and post-harvest phases. This includes timely application of plant protection chemicals in precise doses, timely harvest by well-adjusted harvesting-threshing equipment and transport to the processing plant coupled with earliest seed extraction and mechanical processing before storage, marketing and planting.

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