COMMERCIAL POTENTIAL OF CIPC FOR SPROUT INHIBITION IN POTATOES UNDER HEAP STORAGE

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Abstract: Fogging of CIPC @ 40 ml/tonne of potatoes significantly reduced sprouting, suppressed sprout growth and reduced total storage losses in potatoes up to 90 days under heap storage (19-30°C, 50-88% RH). Single spray application of CIPC also remained equally effective. Findings have great significance as the farmers can store their produce for short-term with negligible sprouting to get remunerative prices.

Globally India now ranks 4th in area, 3rd in production and produces about 25 million tonnes of potatoes from 1.3 million hectares of land. Potato production has touched new heights and as a result we are now facing the problem of plenty. Ninety percent of potatoes in India are harvested in February-March in the Indo-Gangetic plains where they have to be stored during hot summer months. Recurring gluts at harvest are common in areas of large production leading to drastic fall in prices. Prices increase rapidly in April-May and are almost double in July-August (Dahiya and Sharma, 1994). Farmers use indigenous storage practices like pits, heaps, trenches and basements to hold some of their produce for short-term to fetch better prices (Dahiya et al., 1997). Heap storage of ware potatoes is the only on-farm storage method in Punjab to avoid distress sale at harvest (Mehta et al., 2001). In heaped potatoes, though the physiological losses are much reduced, sprouting of potatoes remains the main problem which involves additional expenditure on labour for desprouting of tubers before sending them to the market. Dust application of sprout inhibitor isopropyl N-(3-chlorophenyl) carbamate (CIPC) significantly reduced sprouting, suppressed sprout growth and reduced total losses in potatoes up to 16 weeks of storage in heaps (Mehta and Ezekiel, 2003). However dust application to large quantity of potatoes is not practical from farmers point of view. Now CIPC is commercially available in form of liquid for spray and aerosol application, which may be even applied to comparatively smaller quantity of potatoes. This investigation was therefore, designed to determine the commercial potential of CIPC for use as sprout inhibitor of potatoes under heap storage keeping in view the farmers’ need to store potatoes for short term.

Two methods of application of CIPC (Oorja, commercial product of UPL, Mumbai), viz., fogging and spray application were studied in cultivar Kufri Jawahar which is predominantly stored in heaps in Hoshiarpur district of Punjab (Mehta et al., 2001). Three quintals of large size potatoes (>70 g) were stored in a heap covered with 1.5 ft thick rice straw under a thatched roof made of straw (Sarkanda) and bamboos supported on a wooden beam at a height of 10 ft. CIPC fog was applied twice during storage (20 and 50 days of storage) @ 40 ml/tonne through a perforated PVC pipe laid across the base of heap. CIPC single treatment (after 20 days of storage) was given to potatoes stored in nylon bags in 4 replications of 25 kg each placed in the same heap. Heap was kept air tight during and 48 h after the treatment. Single spray application of CIPC @ 40 ml and 60 ml/ tonne was given to 1.5 q each of potatoes during laying of heaps under a 10 ft high shed with asbestos sheet roofing. Control heaps each of 1.5 q potatoes were also laid nearby under the respective sheds. A daily record of maximum and minimum temperatures and relative humidity was maintained during storage. Final observations on sprout weight (g/kg tuber weight), loss due to tuber rotting and total storage loss were recorded after 90 days of storage. Sprouting Index (SI) for efficacy test was taken on 50 tubers per treatment after storage. Sprout length of all sprouts in a tuber was measured and summed for each potato. A six class scale was used (0 mm, 0-2 mm, 2-5 mm, 5-10 mm, 10-20 mm and >20 mm) and the number of tubers in each class were recorded. SI was calculated as follows:

\[ SI = \frac{\text{Sum} \ i \times \text{number of tubers}}{50} \]

Storage in heaps reduced the daily range of variation in temperatures, while maintaining a high relative humidity (RH). The minimum-maximum temperatures during March to June ranged between 19-30°C in the thatched storage shed as compared to 16-43°C in the ambient. RH inside the heap remained continuously high (50-88%) as compared to lower levels of 32 to 79% in the ambient. Temperatures in the second shed remained 2-3°C higher and RH remained lower by about 5% during last 3 weeks of storage due to overheating of roof.

Both single and double fog treatments of CIPC were equally effective under heap storage. Even single fog treatment was sufficient to reduce sprouting index (by 45%), sprout weight (by 93.3%) and total storage losses in tubers (by 28.4%) up to 90 days of storage as compared to control (Fig. 1). Rottage in tubers was however, high in treated tubers. CIPC fog treatment @ 40 ml/tonne is recommended for complete sprout inhibition at 10-12°C, within a permissible residue level of 30 ppm in the peels of potato (Ezekiel et al. 2003).
Single spray application of CIPC at both the rates also remained equally effective up to 90 days. Even lower rate of application (40 ml/tonne) reduced sprouting index (by 71.5%), sprout weight (by 90.2%) and total losses in tubers (by 30.1%) as compared to untreated control (Fig. 2). Rottage in tubers also did not increase. Total losses were higher and sprout weight was less in the control heap laid under shed with asbestos roofing as compared to the control heap laid under thatched shed. This may be due to higher temperatures and low humidity inside the heap during later periods of storage.

In both the methods of application, sprout growth remained remarkably suppressed (by 90-93%) and there was no need to desprout the tubers before sending them to the market. CIPC treated potatoes appeared firm while control (untreated) potatoes with multiple sprouts gave a much shriveled appearance. After storage, CIPC treated potatoes fetched rates comparable to the cold stored potatoes, which were 50% higher than that at harvest. The results clearly show that CIPC can be successfully applied as fog or spray to achieve significant sprout suppression in potatoes under heap storage. The treatment helps to reduce total storage losses in potatoes also.

This is the first report of sprout suppression in potatoes by CIPC fog and spray application at higher temperatures (19-30°C) under heap storage. CIPC fog is earlier reported to effectively inhibit sprouting at storage temperatures up to 20°C (Ezekiel et al., 2003, Kumar et al., 2003). The findings have great significance as the farmers can store their produce on-farm for short term in near sprout free condition to get remunerative prices.

Literature cited:
Kumar, S., R. Ezekiel and B. Singh. 2003. Weight loss of tubers and chip colour of potato cultivars stored at different temperatures after CIPC treatment. J. Indian Potato Assoc. 30: 175-76.