

Effect of Maleic Hydrazide (MH) and Isopropyl N-(3-Chlorophenyl) Carbamate (CIPC) on Sprouting of Potato Tubers during Storage¹

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ABSTRACT

Potato cultivars treated with MH 2000 ppm 4 weeks before harvest varied in their sprouting. Famosa and Reflecta cultivars that had large foliage at time of spray, sprouted least during storage at 5°C and 80–90% r.h. Tubers from untreated plants sprouted profusely after 3 months of storage. Supplementary treatment with Luxan (as vapour) and Tixit (as dusting), after 6 months of storage, extended the dormancy in tubers up to more than 10 months storage at 5°C. MH plus Luxan-treated tubers were fresher than those treated with MH alone, or MH plus Tixit. Tubers from plants treated with MH showed 40–96% sprouting depending on cultivars, as compared to zero sprouting in tubers from most cultivars treated with Luxan or Tixit during storage.

INTRODUCTION

The sprouting of potatoes in storage is considered to be one of the most important physiological disorders (4). About 33–45% of total losses during storage was attributed to sprouting (7). Sprouting of potatoes, usually followed by shrivelling (4), increased respiration (5) and consequently led to loss of quality. Maleic hydrozide (MH) had been long used as sprout inhibitor (4,8). However, sprouting with short internodes occurs after 4–5 months storage. CIPC (isopropyl N-(3-Chlorophenyl) carbamate) were reported to be very effective as sprout inhibitor when applied as vapour during storage (1,3,4,5,7,8). CIPC is available under different trade marks, Luxan and Sprout-NP., (as liquid), and Tixit (as powder).

The objective of this work was to study the effect of MH alone, with Luxan or Tixit as supplementary treatments during storage, on sprouting of potato tubers during storage.

MATERIALS AND METHODS

Potato seeds of 10 potato cultivars, namely: Famosa, Reflecta, Ajax, Lutina, Mirka, Radosa, Draga, Spunta, Nicola and Ukama were planted on March 4, 1979 in rows of 5 meters of 17 plants each. Planting distance was 30 × 70 cm. Five rows were assigned for each cultivar. The plants were irrigated as required. They received 18 grm NPK (12:24:12) per plant on April 14, 1979. Three of 5 rows from each cultivar were

¹Luxan supplied by B.U. Chemische Pharmaceutische Holland, Tixit by Celamerck GmbH and Co., K.G. Ingelheim-am-Rhein.

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sprayed with Maleic hydrazide (MH) 2,000 ppm 4 weeks before harvest. The other 2 rows were left as control.

Harvesting was done on June 29–30th. The tubers were held 5 days at room temperature for curing. The sound tubers from control and treated lots were sorted and stored at 5°C and 80–90% r.h. The sprouting tendency of cultivars under study was evaluated after 6 months of storage. The unsprouted tubers from Famosa, Reflecta, Lutina, Ajax, and Radosa (pre-harvest treated with MH) were given a supplementary treatment with Luxan (20 cc/1,000 kg as vapour) or with Tixit (as dusting). Three replicates of 20 tubers each were assigned to each treatment. The number of tubers sprouting after 10 months of storage was evaluated.

RESULTS AND DISCUSSION

Potato cultivars treated with MH 2000 ppm 4 weeks before harvest varied in their sprouting tendency after 6 months of storage at 5°C. Famosa, Reflecta, Ajax, Lutina, and Mirka cultivars sprouted least showing, 5, 5, 10, 12, and 15% sprouting, respectively. Ukama and Nicola tubers were virtually sprouted during the same storage period (Table 1).

The variation in sprouting tendency among cultivars could have been due to differences in amount of MH absorbed and translocated into the tubers. Famosa, Reflecta and Lutina cultivars had the largest vegetative growth during MH spray and sprouted least after 6 months of storage; probably more MH was absorbed and translocated to the tuber. Ukama had smallest vegetative part with highest sprouting. Other cultivars were intermediate in both foliage size and sprouting. When unsprouted tubers from

Table 1 Sprouting of different potato cultivars preharvest treated with MH^a after 6 months of storage at 5°C.

Cultivars	Observed foliage size before MH spray	% Sprouted tubers
Famosa	Large	5
Reflecta	Large	5
Ajax	Intermediate	10
Lutina	Large	12
Mirka	Intermediate	15
Radosa	Intermediate	45
Draga	Intermediate	50
Spunta	Intermediate	65
Nicola	Intermediate	95
Ukama	Small	100

^aThe control tubers were all sprouted at the time of evaluation.

Table 2 Effect of sprout inhibitors on sprouting of 5 potato cultivars after 10 months of storage at 5°C.

Cultivar	% sprouted tubers			
	Control	MH 2,000 ppm	MH (2,000 ppm) + Tixit	MH (2,000 ppm) Luxan (20 µL/kg)
Reflecta	100	69	0 ^a	0
Lutina	100	40	0	0
Radosa	100	96	0	0
Ajax	100	89	20	0
Famosa	100	42	0	0

^aStatistical analysis was not possible due to too many zeros.

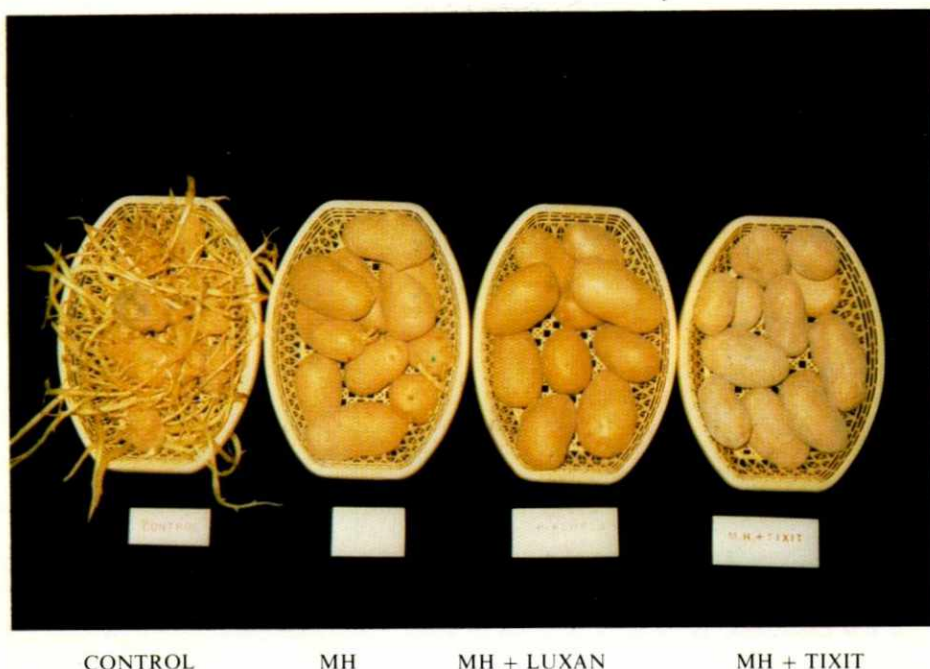


Fig. 1 The effect of MH alone and followed by Luxan and Tixit (as supplement treatment) on sprouting of potato tubers after 10 months of storage at 5°C.

Lutina, Famosa, Radosa and Nicola (pre-harvest sprayed with MH) were treated with Luxan (as vapour) and Tixit (as dusting) after 6 months of storage, complete inhibition of sprouting beyond 10 months of storage was obtained (Fig. 1 & Table 2). Tubers treated with MH plus Luxan were fresher than those treated with MH alone, or MH followed by Tixit. Preharvest treated tubers with MH showed 40–96% sprouting (with short internode sprouts) depending on cultivar. The sprouted tubers showed slight shrivelling. Sprouting in controlled tubers started after 3 months of storage and, by the end of the experiment, the tubers were almost disintegrated (Fig. 1).

When the apical sprouts of Famosa tubers were excised and the tubers then treated with Luxan (as vapour), complete inhibition of lateral buds was obtained. Apical buds were more sensitive to CIPC vapour than lateral buds (4). It was concluded that preharvest spray with MH was not sufficient for long-term storage of potatoes. Luxan treatment during storage, before sprout initiation, can inhibit sprouting up to more than 10 months of storage at 5°C. Thus storage of potatoes for 6–7 months would be expected, without significant loss of quality. Preharvest spray with MH appear to be more effective with cultivars having large vegetative part during spray.

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تأثير مالميك هيدرازيد وايزوبروبيل - ن -
(٣ كلورفينيل) كبراميت على تزرير البطاطس
اشداء التخزين

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المستخلص

تختلف اصناف البطاطس المعاملة بمادة مالميك هيدرازيد ٢٠٠٠ جزء فى المليون ٤ اسابيع قبل الجمع فى درجة تزريرها اثناء التخزين على درجة حرارة ٥م^٥ ورطوبه بنسبة ٨٠-٩٠ . فالاصناف ذات مجموعـة خضرى كبير مثل صنفى فموزا ورفلكتا كانت اقل الاصناف تزرير وان درنات البطاطس الغير معاملة بدأت فى التزرير بغزاره بعد ٣ أشهر من التخزين ووجد ان معاملة درنات البطاطس (الغير مزرعه المعاملة بمادة مالميك هيدرازيد) بمادة لوكسان وتيكست بعد ٦ أشهر ادت الى اطالة سكون الدرناات الى اكثر من ١٠ شهور تحت درجة حرارة ٥م^٥ . وان درنات البطاطس المعامله بمادة مالميك هيدرازيد + لوكسان (كمعاملة مكمله) كانت افضل جوده عنها فى المعاملات الاخرى اذ ان نسبة التزرير فى الدرناات المعامله بمالميك هيدرازيد تتراوح ما بين ٤٠ - ٩٦ / حسب الصنف مقارنة بصفـة نسبة تزرير بعد ١٠ شهور من التخزين فى أغلب اصناف المعاملة بمادتي لوكسان وتيكست اثناء التخزين .