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EFFECT OF PRE-HARVEST SPRAY OF MH AND STORAGE CONDITIONS ON QUALITY OF BULBS OF SPIDER LILY (*Hymenocallis littoralis* L.) CV. LOCAL

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ABSTRACT : The present experiment on storage of bulbs of spider lily (*Hymenocallis littoralis* L.) cv. Local was carried out at Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh during 2011-2012. The experiment consisted of six levels of pre-harvest MH spray with four levels of storage conditions and it was laid out in Factorial Completely Randomized Design (FCRD) design with three replications. Pre harvest spray of MH 3000 ppm was found to be more effective for reducing weight of bulbs, size of bulbs, physiological loss of weight, sprouting of bulbs and spoilage of spider lily bulb. Similarly, biochemical parameters like TSS, total sugars, reducing sugar and non reducing sugar were also found better in MH 3000 ppm for storage of bulbs. During storage the bulbs should be kept in plastic carets at an ambient temperature having good circulation of air in the store room.

Key words: *Maleic hydrazide (MH), pre-harvest spray, spider lily, storage conditions.*

Spider lily (*Hymenocallis littoralis* L.) is native to South America and belongs to the family Amaryllidaceae. It is bulbous ornamental plant with 45-60 cm tall. It has long, broad and strap shaped light green leaves. It is cultivated for its white, fragrant spider shaped flowers for varied uses as loose flower for making *malas*, car decoration, bouquets, etc. An umbel produced 9-10 flowers on its head. 2-3 flower umbels are produced at a time on a single well developed plant. It is suitable for growing in the field as well as in pots. Also as cut flower it is attractive but the flowers do not last long. These are most suitable plants for border plantings in the greenhouse, alongside the boundary walls and water channels, in herbaceous border, alongside the lawn and also in beds in the gardens but these preferred sunny situations. As they are propagated through bulbs, during storage pre-planting sprouting and decay of bulbs are the serious problems. MH is a growth-regulatory substance that disrupts cell division. It spreads upwards and downwards. In stored bulbs it suppresses sprout and root growth. MH penetrates extensively into the plant and is transported in the phloem to actively growing tissues including the bulbs and tubers. Residues persist in these parts sufficiently to induce dormancy and hamper sprouting for fairly.

MATERIALS AND METHODS

The experiment was carried out at Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh during 2011-2012. Three years old standing crop of spider lily was selected for pre harvest treatments. During the pre harvest spray the standing crop was under rest (leg phase of flowering). Spray of maelic hydrazide (MH) at different concentration was done as per treatments, one month before uplifting of bulbs The experiment consisted of six levels of pre-harvest MH spray P_0- Control (No MH treatment), P_1- 500 ppm, P_2- 1000 ppm, P_3- 2000 ppm, P_4- 3000 ppm and P_5- 4000 ppm. The bulbs were carefully dugout and uplifted. They were cleaned and separated from upper plant portion. Bavistin fungicide as treatment was given to these bulbs before storage study and stored in different four levels of storage conditions S_0- Plastic carets at 12°C, S_1- Net bags at 12°C, S_2- Plastic carets at an ambient temperature and S_3- Net bags at an ambient temperature and it was laid out in Factorial Completely Randomized Design (FCRD) design with three replications. Pre harvest treatment wise bulbs were stored at different conditions mentioned in treatments for storage study. During storage of five months at the end of each month the laboratory observations were recorded from February 2012 up to June month 2012.

RESULTS AND DISCUSSION

Effect of Pre-harvest MH Spray

Physical parameters

Treatment of MH 3000 ppm (P_4) resulted in outstanding effects on all vegetative parameters under trial (Table 1). Weight of bulbs was significantly

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decreased during initial month to fifth month (23.50g to 9.98g) in P_4 (MH 3000 ppm) but the decrease was minimum among all the MH treatments. Size of bulbs was also decreased from one month to fifth month storage (48.86mm to 43.88 mm). The decrease in the moisture content of the bulbs was also noticed. The pre-harvest spray of MH might be resulted in reduction in moisture content of the bulb was also noticed and thereby the hydrolysis of sugar minimises and ultimately resulted in highest dry matter content due to accumulation of more sugar (Mahadevaswamy, 4). Increase in physiological loss of weight (PLW) from one month to fifth month (2.10% and 46.28%, respectively) was found minimum with MH 3000 ppm (P_4). It might be due to the fact that MH acts as an inhibiting substance in reducing the respiration of the bulbs which in turn reduces the loss of moisture from the bulbs (Waskar *et al.*, 10). The chemical has played a role in modifying the rate of gaseous exchange that takes place through the surface of the bulb by changing the balance of carbon dioxide and oxygen in the bulbs and, thus, minimizes the respiration and transpiration which in turn to reduce the rate of moisture loss and ultimately prevented the loss in weight (Mahadevaswamy, 4). Momin *et al.* (5) have also reported minimum weight loss in carnation cuttings stored for short duration. It might also be attributed to the beneficial effect of MH, an anti-auxin, which acts as mitotic inhibitor, chromosome breaking agent and growth suppressor (Pandey and Pandey, 6). Minimum sprouting percentage was found in P_4 (MH 3000 ppm) during storage of one months to fifth month (4.83% and 22.08%, respectively). This may be due to the prolonged dormancy or sprout inhibition for longer period after harvest by MH. This could be attributed to reduce neck thickness in sprayed bulbs and by way of minimized cell division and due to the removal of apical dominance inhibiting sprouts initiation. The residue of MH reduces mitotic activity in the cell and ultimate cell division and thereby reduced the length of sprouts in the bulbs (Singh and Dhankhar, 9). Among the MH treatments the minimum spoilage percentage during one month to fifth month storage was found in MH 3000 ppm (3.42% and 16.67%, respectively). The least spoilage per cent may be due to positive and beneficial effect of maleic hydrazide in reducing the neck thickness and preventing entry of microorganisms into the bulbs. Similar results were reported by Singh and Dhankhar (9) in onion.

Table 1: Effect of pre harvest spray of MH concentrations and storage conditions on physical parameters of stored bulbs of spider lily.

Treatment	Storage period									
	Weight of bulb (g)		Size of bulbs (mm)		Physiological loss of weight (%)		Sprouting percentage (%)		Spoilage percentage (%)	
Pre-harvest spray treatments	Initial	Fifth month	Initial	Fifth month	One month	Fifth month	One month	Fifth month	One month	Fifth month
P_0 - 0 (Control)	18.67	7.93	46.26	42.30	4.49	49.65	7.96	35.42	7.08	26.67
P_1 - 500 ppm MH	20.04	8.90	46.53	41.23	8.1	50.18	7.67	33.83	6.83	24.25
P_2 - 1000 ppm MH	21.54	9.79	46.82	39.63	17.69	54.56	7.88	31.17	6.50	23.17
P_3 - 2000 ppm MH	22.67	8.75	45.95	40.88	3.24	51.60	7.63	30.67	6.33	22.92
P_4 - 3000 ppm MH	23.50	9.98	48.86	43.88	2.10	46.28	4.83	22.08	3.42	16.67
P_5 - 4000 ppm MH	19.45	9.79	48.34	44.03	4.13	52.31	5.54	26.08	5.33	19.42
C.D. (P=0.05)	2.99	1.14	2.16	2.27	3.28	2.12	1.36	2.66	1.24	2.14
Storage conditions										
S_1 - Plastic carets at 12°C	17.81	8.57	46.15	41.09	6.30	49.50	6.17	27.89	6.06	22.61
S_2 - Net bags at 12°C	20.23	9.31	46.14	42.35	06.82	53.98	5.72	27.67	6.28	23.56
S_3 - Plastic carets at am ambient	24.61	10.27	46.98	42.76	06.85	45.18	7.94	31.83	5.61	20.61
S_4 - Net bags at an ambient temp.	21.27	8.62	46.00	41.76	05.33	42.32	7.83	32.11	5.72	21.94
C.D. (P=0.05)	NS	0.93	NS	NS	NS	1.73	1.11	2.17	NS	1.75
Interactions: P × S										
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
C.V.%	17.35	15.04	5.58	6.58	35.00	9.13	23.98	10.84	25.51	11.74
Storage Period	20.98	9.19	47.13	41.99	5.40	48.24	6.92	29.88	5.92	22.18

Table 2 : Effect of pre harvest spray of MH and storage conditions on chemical parameters of stored bulbs of spider lily.

Treatment	Storage period							
	TSS of bulb (ºBrix)		Reducing sugar of bulb (%)		Total sugar of bulb (%)		Non-reducing sugar of bulb (%)	
Pre-harvest spray treatments	**Initial**	**Fifth month**	**Initial**	**Fifth month**	**Initial**	**Fifth month**	**One month**	**Fifth month**
P_0 - 0 (Control)	9.83	6.96	1.80	0.62	3.61	5.01	1.81	4.37
P_1 - 500 ppm MH	10.25	7.43	1.86	0.77	3.86	5.07	2.00	4.30
P_2 - 1000 ppm MH	10.17	7.46	1.85	0.76	4.00	5.33	2.16	4.57
P_3 - 2000 ppm MH	10.25	7.58	1.80	0.74	4.09	5.65	2.30	4.91
P_4 - 3000 ppm MH	11.25	8.84	1.58	0.69	4.18	6.03	2.70	5.34
P_5 - 4000 ppm MH	10.75	8.24	1.47	0.76	4.17	5.92	2.60	5.16
C. D. (P=0.05)	NS	0.95	0.10	0.10	0.07	0.10	0.13	0.12
Storage conditions :								
S_1 - Plastic carets at 12℃	10.00	7.24	1.74	0.68	3.97	5.46	2.24	4.70
S_2 - Net bags at 12℃	9.78	7.16	1.73	0.72	3.98	5.44	2.22	4.69
S_3 - Plastic carets at am ambient	11.72	9.03	1.77	0.76	4.02	5.59	2.33	4.96
S_4 - Net bags at an ambient temp.	10.17	7.58	1.67	0.73	4.00	5.51	2.23	4.75
C.D. (P=0.05)	NS	0.78	NS	NS	NS	0.08	NS	0.10
Interactions: P × S								
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS
C.V.%	11.65	14.92	7.33	16.58	2.15	2.18	7.04	3.01
Storage Period	10.42	7.75	1.72	0.72	3.99	5.50	2.26	4.77

Chemical parameters

The highest T.S.S. was found in 3000 ppm maleic hydrazide (MH) in decreasing trend with advancing in storage period (11.25º Brix to 8.84, during fifth months), however, it was at par with P_5. This may be due to accumulation of more carbon dioxide and low oxygen inside the bulbs and its suicidal effect on respiration which ultimately reduces the respiration rate thereby reducing the losses of TSS (Mahadevaswamy, 4). Decreasing reducing sugar with lowest storage period and shortest reducing sugar was found in MH 3000 ppm (1.58% and 0.69%, respectively), this may be due to the utilization of reducing sugars, like glucose and fructose for respiration and sprouting during storage and thereby the level of these constituents decreased during on storage period (Patil and Kale, 7). Persual of Table 2 revealed that total sugar was significantly increased with increasing storage period (4.18% to 6.03%,) and it was the highest at 3000 ppm MH being at par with P_5. The decrease reducing sugars during storage in all treatments may be due to the utilization of reducing sugars, like glucose and fructose for respiration and sprouting during storage and thereby the level of these constituents decreased during of storage period. These results are in close agreement with the findings of Mahadevaswamy (4) in onion. Whereas, increasing in non-reducing sugar (2.70% to 5.34%,) was found with MH 3000 ppm (P_4), but it was at par with P_5. The maximum non-reducing sugar content was mainly due to less consumption of sugars in the process of respiration and minimum breakdown of non-reducing sugars results in increase in the non-reducing sugar content of the bulbs (Mahadevaswamy, 4).

Effect of Storage Conditions

Physical parameters

The spider lily bulbs stored in plastic carets at an ambient temperature of bulbs (S_3) were found superior with respect to minimum decrease in weight of bulb during one month to fifth month's storage (24.61g to 10.27g). This treatment also resulted in outstanding (lower) decrease of bulb size (46.98 mm to 42.76mm,) during five months storage (Table 1). This may be due to the maximum dry matter content during storage which could be reasoned due to the decreased moisture content of the bulbs and increased in chemical constituents in turn resulting in more bulb weight (Beukema and Vanderzaag, 1). Among the four storage conditions lowest physiological loss of weight during one month to fifth month storage (5.33% and 42.32%,) was found in net bags at an ambient temperature (S_4). Minimum PLW under cold conditions was probably due to less transpiration and respiration due to low temperature and high relative humidity in potato (Beukema and Vanderzaag, 1). Minimum sprouting percentage was found in net bags at 12ºC 5.72% to 27.67 %,) but it was at par with (S_1). Whereas, minimum spoilage percentage was found in plastic carets at an ambient temperature with lower rate in increasing spoilage percentage from initial to five months of storage. (5.61% to 20.61%). This may be due to proper ventilation as well as minimum fluctuation in storage temperature (Maini *et al*., 3).

Chemical parameters

Data in Table 2 revealed that maximum decrease in TSS was found in bulbs stored in plastic carets at an ambient temperature (11.72 ºBrix to 9.03 ºBrix,) Retaining of higher per cent of TSS may be due to more loss of moisture and increase in dry matter content of the bulb which leads to increase in TSS content. These results are in close conformity with findings of Saimbhi and Randhawa (8) in onion. Similarly, reducing sugar was found significantly highest in S_3 (plastic carets at an ambient temperature (1.77% to 0.76%) during fifth month. The higher per cent in loss of reducing sugar may be due to more loss of moisture and increase in dry matter content (Saimbhai and Randhawa, 8). Total sugar was found increasing with increase in storage period (S_3) in plastic carets at an ambient temperature (4.02% and 5.59%, respectively). This may be due to increase in total sugar content due to increase in pyruvic acid content which might have increased the synthesis of volatile compounds and enhanced non-reducing sugar (Kumar and Singh, 2). Similarly, non-reducing sugar was also found increasing with and increasing in storage period when stored in (S_3) plastic carets at an ambient temperature (2.33% to 4.96%)

From the foregoing discussion, it can be concluded that to get healthier and un-sprouted bulbs after five months of storage the standing lily crop must be sprayed with 3000 ppm MH before one month of harvesting (uplifting) of bulbs. Bulbs stored at an ambient temperature in plastic carets were also exhibited positive response for storage.

REFERENCES

1. Beukema, H.P. and Vanderzaag, D.E.(1990). Introduction of Potato Production. Centre for Agricultural Publishing and Documentation (PVDOC), Washington, pp. 139-154.
2. Kumar, A. and Singh, O. (1992). Dry matter accumulation of sulphur deficient onion plants. *Indian J. Agri. Res.,* **26** (2): 107-109.
3. Maini, S.B., Sagar, U.R., Chandan, S.S. and Kumar R.(1997). Evaluation of different structures for storage of onions. *Vege. Sci.* 24(1): 73-74.
4. Mahadevaswamy, K.L. (1984). Studies on the simple storage techniques for onion cv. Ballary Red with pre-harvest treatment of maleic hydrazide. *M.Sc. Thesis*, University of Agricultural Sciences, Bangalore.
5. Momin, K.C., Dhiman, R.C., Gupta, Y.C. and Kumar, S. (2014). Effect of storage duration on rooting of carnation (*Dianthes caryophyllus.* L.) cuttings. *HortFlora Res.* Spectrum, **3**(3) : 249-253.
6. Pandey, R.P. and Pandey, A. (1994). Storage losses of onion bulbs. *Madras Agri. J*., **81**(11): 603-605.
7. Patil, R.S. and Kale, P.N. (1988). Biochemical changes during high temperature storage of bulbs of some onion cultivars. *J. Maharashtra Agric. Uni.,* 13 (1): 108-109.
8. Saimbhi, M.S. and Randhawa, K.S. (1982). Losses in white onion variety Punjab-48 under ordinary storage conditions as influenced by bulb size. J. Res. *Punjab Agric. Univ.*, **19** (3): 188-190.
9. Singh, J. and Dhankhar, B.S. (1995). Effect of pre-harvest chemical treatment on storage loss of onion. *Adv. in Hort.* and Forestry, **4** : 119-126.
10. Waskar, D.P., Masalkar, S.D., Gaikwad, A.R. and Garande, V.K. (2004). Effect of pre-harvest treatment of growth regulator and fungicides on storage of onion. *Nat. Sympo. on Onion and Garlic Production and Post-Harvest Management: Challenges and Strategies*, 19-21 November 2000, National Research Centre For Onion and Garlic, Rajgurunagar, Nasik, P. 223.

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