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CAUSES OF RAPID WILTING OF CUT DAHLIAS AND MEANS TO IMPROVE THEIR KEEPING QUALITIES

PNINA BAR-SELLA
Faculty of Agriculture, The Hebrew University, Rehovot

ABSTRACT

Cut dahlias have a rather short keeping life, corresponding to a relatively short life of inflorescences blooming naturally on the mother plant. Two days after picking, uptake of water is hampered by plugs originating in the xylem vessels.

Bacterial infections, affecting keeping qualities adversely, are not of primary importance, since antibiotics increase keeping time only by about one day. Treatments reducing respiration rate, as dipping stems in maleic hydrazide (50 p.p.m.) increase keeping time by about the same period.

MATERIALS AND METHODS

Two varieties of dahlias were used throughout this investigation (while other varieties were occasionally tested):

1. "Tel Aviv". A yellow-red local variety belonging to the "Formal Decorative" class with a head 11-14 cm in diameter.

2. "Rosy Pink". A medium purple-pink variety belonging to the "Miniature Decorative" class with a head 8-9 cm in diameter.

The dahlias were picked in the morning and transferred to jars each containing 500 cc of different solutions of preservative substances (six replicates).

Wilting proceeds centripetally. A scale of 6 progressive degrees was used. "1" designating incipient wilting of only the external row of ray florets, "6" complete wilting and brown discoloration of the whole head. Intermediate degrees symbolize progressive wilting, coupled with loss of turgor and colour.

Sections of stems were examined for bacteria by the "Claudius" method (Schneider and Zimmermann 1922). The "Gram" method (Johansen 1940) was used for their preliminary classification. The daily changes in weight of excised flower heads and the amount of water absorbed through their stem were determined. A few analyses of CO_2 output by inflorescences were carried out with a slightly modified apparatus of Heinicke (Heinicke and Hoffmann 1933).

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RESULTS

Influence of preservative chemicals on rate of wilting

Water controls attained degree "3" of the wilting scale about 4-5 days after picking, and differences between varieties and preservative solutions were slight (± one day).

A slight improvement in keeping qualities was obtained by immersion of stems into warm water (50° C) and by use of "Chrysal" (a commercial flower preservative — by Pokon at Naarden, Holland), while very hot water treatment (100°C) often recommended and popular with house-wives, was found detrimental.

Wilting of dahlias unsevered from the mother plant

Comparing wilting of cut dahlias with that of unsevered flowerheads, it was found that the latter remained only for about two more days in marketable condition. Floral "life" of dahlias is therefore short even under natural conditions.

Bacteria and their control

Bacteria are found only on the cuts of picked still fresh-looking dahlias. In wilting flowers kept in water for several days, they can be found in all internal tissues of the submerged stem, especially around xylem and phloem bundles. Their number increases as wilting progresses.

To control bacterial growth, antibiotics were used. Penicillin-procain and streptomycin were used as aqueous solutions, dissolving 120,000 units in 300 ml of water, while penicillin was smeared as a paste (1000 units per gram) on the stem.

In both varieties streptomycin retarded wilting by about one or two days, the difference against water controls being highly significant. Both penicillin solution and paste had a lesser effect, but retarted wilting at least in one of the two above-mentioned varieties. The streptomycin treatment controlled bacterial growth almost completely during seven days, and even wilted inflorescences did not show appreciable amounts of bacteria. It should be noted that this antibiotic controls both Gram positive and Gram negative bacteria.

Inhibition of respiration

Assuming that wilting is at least in part a consequence of depletion of assimilates, it was tried to delay it by slowing down respiration and other katabolic processes. The following solutions of growth regulators were tried : 2,4 - D (5 and 20 p.p.m.), ethyl phenyl carbamate (3 p.p.m.), maleic-hydrazide (M H : 50 and 200 p.p.m.). Dahlias were kept with their stems in the above solutions. While the 2,4-D treatments increased the rate of wilting, as expected, and the carbamate treatment did not differ from control, the M H treatment was found to delay wilt-

ing. The 50 p.p.m. solution significantly delayed wilting of both varieties, the 200 p.p.m. only of the Rosy Pink variety (Figure 1).

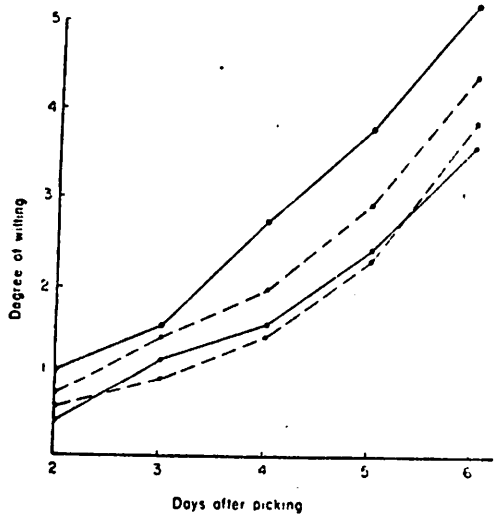

Figure 1

Degrees of wilting attained by picked dahlias kept in water (W) and in 50 p.p.m. maleic hydrazide (MH) for a number of days. Variety Tel Aviv: ————. W, upper; MH, lower curve. Variety Rosy Pink: — — — — . W, upper; MH, lower curve.

Since M.H. treatments reduced the rate of wilting, a few respiration measurements were carried out with flower heads kept in solutions of 50 p.p.m. M H Table I shows much larger output of carbon dioxide by flower heads kept in water than in M H While output in water increased with time, it decreased in M H solution. In contrast, 2,4-D has been found to increase respiration of plants, especially in low concentrations (Kelly and Avery Jr. 1949).

TABLE I

Average carbon dioxide output (mg/hr) of comparable dahlia's heads kept in water and in 50 p.p.m. maleic hydrazide

	After 1 day	After 3 days
Water control	8.9	10.1
50 p.p.m. M.H.	6.2	5.5

Water relations and plugging of vessels

Figure 2 shows daily changes in weight and water absorption by dahlia inflorescences of the Tel Aviv variety when kept in water for a few days. Similar trends were found with the variety Rosy - Pink. There is a trend towards a decrease in both processes during 6 days from cutting. An increment in weight has been established during the first 48 hours, but later on, the weight of inflorescences decreases

as compared with initial weight. At the same time, water absorption decreases from about 10 ml during the first day, to less than 1 ml during the sixth.

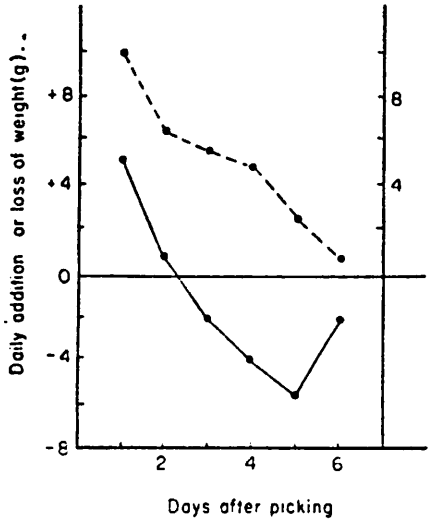

Figure 2

Daily addition or loss of weight (g, •————•) of cut dahlias (Tel Aviv variety) and their daily absorption of water (ml, •———•———•)

The initial increase in weight seems to be linked with initial uptake of water, filling up a saturation deficit, while later on, weight decreases because of transpiration and to a lesser extent, as a consequence of respiration. One of the reasons for decreased water uptake seems to be obstruction of vessels by brown plugs which can be seen in transverse section, especially in the vicinity of the basal cut. They seem to originate from disintegrated cellular material, and could not be analysed. On the other hand the relatively small number of thyloses found could hardly explain the reduction of water uptake in contrast to assumptions by Molisch (1888).

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