INFLUENCE OF TEMPERATURE CHANGES ON THE WATER CONTENT OF SALIX AND OF HELIANTHUS

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Rooted willow twigs growing in culture solutions in the open at Stanford University showed signs of wilting during the early morning hours. The solution temperature was usually 15° C. to 16° C. By ten o'clock the temperature of the solution reached 20° C. to 26° C. and the apparently wilted condition of the plants disappeared. A number of experiments have been performed to determine the change in the water content due to temperature changes around the roots of the above plants. *Helianthus annuus* L., 20 cm. to 60 cm. high, grown in sandy loam, and well-rooted cuttings of *Salix laevigata* Bebb and *S. exigua* Nutt., grown in culture solution, were used. Temperature of the solution and of the air, and the evaporating power of the air shown by the Livingston black-and-white porous cup atmometers, were recorded for each experiment.

One set of *Helianthus*, 20 to 60 cm. high, was allowed to wilt for several hours before the experiment. Six to ten plants were collected from each set, about one-half of the remainder being put in water at 22° C. and one-half at 12° C. After one and a half to four hours the plants were collected and dried at 103° C. and their water content calculated on the dry weight basis. Plants in cold water showed little recovery in one to four hours. (See Table 1 for results of experiments 1-7.)

Helianthus plants, 60 to 70 cm. in height, kept turgid for a number of days, were placed in water at 22° C. for several hours before the beginning of the experiment. About half of the leaves had been removed and the plants were placed in water at 12° C. At the expiration of one and a half to four hours the remaining leaves were removed and dried and their water content calculated. (See Table 1, Exps. 8-10.)

From *Salix* plants growing in culture solutions at a temperature of 22° C. about half the leaves were removed and the specimens immediately transferred to a solution at 12° C. and kept in bright sunlight as in the previous experiment. Drooping of the leaves was noticed in less than half an hour. The remaining leaves were collected and dried as above. (See Table 1, Exps. 11-15.)

The experiments reported herein seemed to show that low temperatures hinder the intake of water. If plants having a water deficit are placed in water of a low temperature the water content increases, but at a much lower rate than when they are in warmer water. If they do not have a water deficit, they lose water faster than they take it up, this resulting in flaccid leaves and a lower water content. The same apparent stage of wilting is a poor criterion for the same water content in *Helianthus*. *Salix* with very abundant young leaves shows a greater and quicker response to a cold solution. Large numbers of cultures were used for each experiment and those plants compared whose water contents were closest at the beginning of the experiment.

TABLE 1

Experiment No.	Helianthus	% Water at Beginning	% Water at End	Increase	Decrease	Time—Hours	Temp. of Solution °O.	Atmometer—Black. C.C.	Atmometer—White. C.C.	Air Temperature °C.
1	......	509.5	616.4	106.9	......	1½	22	7.5	6.1	31
	......	610.8	666.9	56.1	......	1½	12	......	......	......
2	......	619.7	837.	217.3	......	3	22	14.5	11.5	31
	......	584.8	772.4	187.6	......	3	12			
	......	422.9	560.	137.1	......	3	12	......	......	......
3	......	789.	1034.7	254.7	......	4	22	24.	17.	29
	......	788.4	907.5	119.1	......	4	11	......	......	29
	......	299.4	514.7	214.8	......	4	22	......	......	29
	......	416.6	491.3	74.7	......	4	11	......	......	29
4	......	389.5	572.1	182.6	......	6	22	25.7	16.5	28
	......	556.3	662.5	106.2	......	6	11	......	......	......
5	......	394.6	422.6	28.0	......	4	12	21.7	15.8	28
	......	346.0	440.6	94.6	......	......	12	......	......	......
	......	338.1	495.1	157.	......	......	22	......	......	......
	......	371.3	519.4	148.1	......	......	22	......	......	......
	......	419.7	633.	213.3	......	......	22	......	......	......
6	......	332.3	470.5	138.2	......	4	22	13.6	8.4	25
	......	408.9	522.5	113.6	......	......	12	......	......	......
7	......	347.0	474.1	127.1	......	3	12	13.2	7.64	26.5
	......	345.1	371.6	26.5	......	......	12	......	......	......
	......	410.1	625.4	215.3	......	......	22	......	......	......
8	......	642.1	571.1	......	71.	4	12	13.6	8.4	25
9	......	350.6	288.	......	62.6	3	12	11.6	7.8	26
10	......	525.7	503.3	......	22.4	1½	12	12.	8.	37
11	S. laevigata	565.3	251.9	......	213.4	6	12	25.7	16.5	28
12	......	427.	386.9	......	40.1	1½	12	4.9	2.5	26
13	S. exuga	245.2	225.4	......	19.8	1½	12	4.9	2.5	26
	......	303.	286.5	......	15.5	1½	12	4.9	2.5	26
	......	232.1	225.8	......	6.3	1½	12	4.9	2.5	26
14	......	481.7	352.5	......	129.2	1½	12	12.	8.	37
15	......	2500.4	1625.8	......	878.6	2	12	6.2	3.8	37