Effect of Air-Soil Temperature on the Flowering of Wedgewood Iris

H. M. Cathey, Graduate Assistant
Department of Floriculture
Cornell University

Flowering time of Iris tingitana, variety Wedgewood was accelerated by the use of high soil-low air temperatures. It was found that a soil temperature of 65°F with a minimum night temperature of 50°F produced flowering in the shortest time with the least amount of blasting. Blasting of the flowers was found to be associated with long periods of dry storage and rotting of the roots resulting from high soil temperature (80°F). Direct benching of freshly flatted bulbs was found to be possible with bulbs stored at 36°F.

These experiments were made to determine the effects of high soil-low air temperatures upon the forcing of Wedgewood iris. The freshly dug bulbs (8 1/2-9) were received September 17, 1952 and September 12, 1953, and stored dry at 36-40°F. Starting November 10, 1952 and November 5, 1953 thirty bulbs were flatted 3 x 3" in sterilized soil to which peat and coarse sand had been added. At three week intervals, additional plantings were made until the middle of March.

The treatments consisted of 40, 50, 60°F air temperatures in combination with soil temperatures of 40, 50, 60, 65, and 80°F. The air temperatures were controlled by automatically heated and ventilated greenhouses. The soil temperatures were produced by electric cable embedded in moist peat moss. The flats were placed on this material and the soil temperature was accurately maintained by the thermostat which was checked by a soil thermometer.

Storage Treatment

The bulbs were dug in August, given a heat treatment by the bulb producer, then stored at 36-40°F. This temperature sequence was based on the Dutch research which showed that most rapid flowering over a long period would result from a high-low temperature shift prior to planting. Earliest flowering with the variety Imperator was obtained by Blaauw, Luyten, and Hartsema (1) by a treatment of one week at 88°F, planted and held at 48°F until the shoot was 2 1/2 inches, then shifted to 59°F until flowering. Flower initiation occurred at the time the shoot was 2 1/2 inches long, continued treatment at 48°F retarded flower initiation but a shift to 59°F rapidly initiated and developed the flowers. They found it possible to obtain 50% and sometimes 75% blooming.

Four to five weeks at 80°F guaranteed a higher percentage of flowering (80-90%) but the longer hot period produced later flowering. The Dutch (Tuinbouwgids, (2) suggested a storage temperature of 80°F for as long as six months, then 48°F until the leaves are 2 1/2 inches above the top of the bulb, then below 60°F until flowering.

This experiment was a compromise between direct flatting--outdoor storage and the long term dry storage method. By the use of a high soil temperature which would reduce the time required to develop the shoot to the 2 1/2 inch stage but at the same time a low air temperature to reduce the loss of stored food due to respiration, it was hoped flowering in the minimum time with the smallest percentage of blasting would be obtained.

Soil-Air Treatment

In the 1952-1953 plantings, air temperatures of 40 and 50°F were used. The higher the soil temperature treatment, the shorter the period necessary for flowering. In the first planting (Fig. 1), the 80°F soil, 50°F air flowered in 58 days. Bulbs grown at 40°F continuously flowered in 135 days. In the subsequent plantings, the same response was obtained (Table 1). Little difference in flowering time was obtained after the 1/26/53 planting date which could be attributed to

Table 1

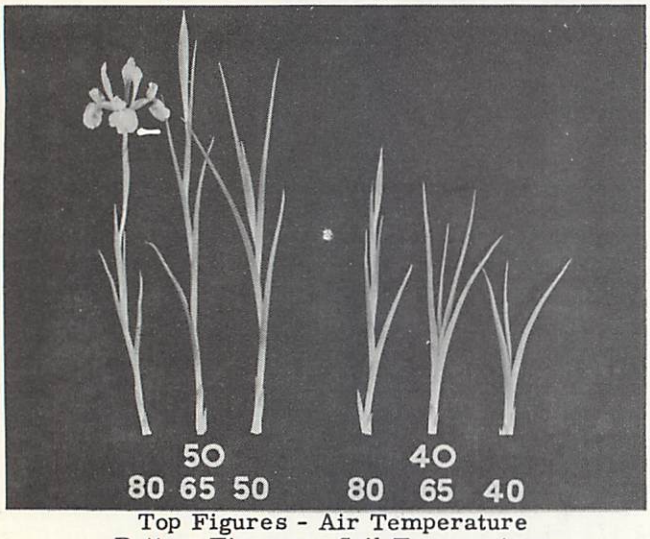
Average Number Days to Flower Iris-Variety Wedgewood

Temperature Treatment	Soil	80	65	50	80	65	40
	Air	50	50	50	40	40	40
Planting Date							
11/19/52		58	64	82	92	100	135
12/16/52		--*	64	73	85	97	107
1/6/53		--*	56	66	73	81	93
1/26/53		57	57	64	70	78	85
2/16/53		39	45	51	59	64	73
3/11/53		--*	42	51	--*	58	63

* No flowers produced.

the high soil temperature.

Most rapid forcing did not always produce the highest percentage flowering. Eighty degree soil temperature, regardless of the air temperature, produced irregular blooming. As Table 2 shows, the percentage flowering varied from 96% with the 1/26/53 planting to 0% with several plantings. At the lower air temperature (40°F) a higher percentage flowered. Consistently high percentages were obtained with equal air-soil temperature treatments but the delay in flowering was great in comparison to the high soil temperature treatments. The use of a 65°F soil treatment resulted in a consistently high percentage of flowers. The flowering time was longer than in the 80°F soil treatment but it was much more advanced in comparison to the equal air-soil temperature treatment.



Top Figures - Air Temperature
Bottom Figures - Soil Temperature
Wedgewood Iris Planted 11/19/52
First Flower Open 1/12/53

The use of high soil temperature treatments resulted in shorter stemmed flowers and flowers which weighed less. The leaves produced by high soil temperature treatment plants were poorly developed (Fig 1). Fresh and Dry weight samples were taken of the leaves and it was found that 80/50, 65/50, 50/50 produced respectively 6.6, 10.0, 14.0% dry weight. With the 40°F air temperature plants, there was little difference in the percentage dry weight, the low soil temperature produced heavier flowers.

Table 2

Percentage Bloom of Iris-Variety Wedgewood

Temperature Treatment	Soil	80	65	50	80	65	40
	Air	50	50	50	40	40	40
Planting Date							
11/19/52		80	83	90	43	63	96
12/16/52		--*	86	80	10	96	100
1/6/53		--*	82	87	46	96	90
1/26/53		76	93	100	96	100	100
2/16/53		26	96	90	43	96	80
3/11/53		--*	17	16	--*	14	40

* No flowers produced.

In the 1953-1954 plantings, the higher air temperatures of 50, 60°F were used. The same effects were produced. The use of 80°F soil temperature greatly increased blasting in the 60°F air treatment; the percentage of flowers ran 25% or less.

Shift Treatment

Some flats were shifted from the high soil temperatures to the equal soil and air temperature at the time of bud initiation (shoot 2 1/2" long). It required approximately three weeks in the 80/50 treatment to attain this growth. With the 1/6/53 planting (Table 3) the continuous high temperature produced no flowers; whereas, the transferred plants produced a high percentage of flowers. The transferred plants were delayed in flowering for about one week at the 50°F air-soil temperature but there was little difference in time to flower and percentage flowers in the 40°F air-soil temperature. This can be attributed to the low temperature which limited growth.

Table 3

Effect of Transfer From High Soil Temperature to Equal Air-Soil Temperature on the Days to Flower and Percentage Bloom Wedgewood Iris

Temperature Treatment	Soil	80	65	50	80	65	40
	Air	50	50	50	40	40	40
Number Days to Flower							
Continuous		--*	56	66	73	81	93
Transfer		53	63	--*	77	81	--*
Percentage Flowers							
Continuous		0	82	87	46	96	90
Transfer		80	75	--*	30	77	--*

* No flowers produced.

Summary

The use of an elevated soil temperature resulted in earlier flowering of Wedgewood iris regardless of the air temperature in the range 60 to 40°F. Associated with most rapid flowering was a high percentage of blasting. Soil temperature, 15°F above the air temperature resulted in a consistently high percentage of flowers, and a shorter forcing period. The grade of flowers produced was higher and more uniform in comparison to the higher (80°F) soil temperature.

Shifting of plants from 80°F soil temperature to equal soil-air temperature resulted in a greater percentage of flowers, flowering time was reduced by one week at 50°F air and 16 days at 40°F air temperature.

High soil temperature reduced the amount of foliage produced, both in fresh and dry weight.

References

(1) Blaauw, A. H., I. Luyten and A. M. Hartsema. Snelle floei van Hollandsche irrisen I (No. 48). K. Akad van Wet. Sci. Sec. Proc. 391:604-612, 1936.

(2) Tuinbouwgids 1954, page 431.

* * * * * * * * * * * *

Your editor,

Richard C. Richardson