

shade than the corolla and may remain so. Metachromatic flowers occur frequently¹⁾.

Flowers of lighter shades increase in colour on ageing or vice versa (and change from lavender to reddish).

Amphichromatic flowers were mentioned for *Calluna vulgaris* for the first time by LINDMAN.

In three instances such plants were found by us; one specimen showed a strictly white flowering shoot on a plant with purple-lavender flowers. In two cases dark-lavender shoots were found on light-lavender flowering plants. In one of the latter cases dark flowers occurred between the light ones at places, while sectorial colouring of single flowers was observed on the same plant.

I wish to express my sincere thanks to the misses Ir. N. KRIJTHE and A. KRIJTHE, to Mr. JOH. JANSEN and to my wife for much assistance during the many field-excursions.

Wijster (Drenthe), 18 Oct. 1935.

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¹⁾ LINDMAN (1907) introduced the terms poly-, hetero-, meta- and amphichromatic.

Botany. — *The opening of the flower-buds of Calluna vulgaris* (L.) Salisb.
By W. BEIJERINCK. (Communicated by Prof. L. G. M. BAAS BECKING).

(Communicated at the meeting of November 30, 1935).

The main flowering-season of the Scotch heather in August coincided this year in our country with a prolonged period of drought. Many *Calluna* plants showed a remarkable development of the flower-buds in so far as the plants were covered at the end of August with almost exclusively closed, but entirely mature buds of about the same size.

This phenomenon appeared as a more or less simultaneous bud development if really a retardation phenomenon in the opening of the buds existed. Mr. and Mrs. L. G. M. BAAS BECKING communicated to me certain preliminary observations performed September 1934. 91 Flower-buds on 12 plants were individually marked with pieces of string. At 4.30 p.m. the first buds opened. This continued until the next morning 9 o'clock after which no more buds opened until next evening. Twigs, bearing 70 buds were placed under a glass jar lined with moist filter paper. Both in the light and in the shadow the calyx opened within 30 minutes (17 September 1934). Lowering of the temperature did not cause the buds to open.

These findings are in contrast with the circumstances that caused the opening of the flowers of the tropical orchid *Dendrobium crumenatum* Lindl. According to J. KUIJPER here lowering of temperature seems to be the stimulus.

If cut twigs of these retarded *Calluna*-plants were placed in water the flower-buds opened very soon. This phenomenon warranted the belief that the conduction of water might play an important rôle in the opening of flower-buds in contrast with the cooling effect observed for the tropical orchid *Dendrobium crumenatum* Lindl.¹⁾

After some preliminary attempts the following course was taken. Twigs were cut below the last annual shoots of one individual with many large closed flower-buds. In this way part of the 1934 long-shoots were gathered too. Twelve twigs of about the same size with exclusively closed buds were placed in glass containers. Six twigs were placed in rain water and six in a moist atmosphere. Eight containers were placed in larger glass jars, partly in dry air (obtained by means of CaCl_2) and partly in moist air. In this way direct water supply and moisture of atmosphere were varied. Of every series one glass was placed at higher temperature (18,4—24,9° C) and one glass at lower temperature (15,6—17,0° C). All in dark. The experiment was started August 23 at 18 o'clock. Twice every 24 hours the number of opened flower-buds, humidity and temperature were ascertained. The observations are given in the table. After the number of opened flower-buds the percentage of the total number is given in brackets, the last column of the table gives the total number of flower-buds on every twig. The figure gives the course of the buds opening.

When we keep in mind the preliminary nature of these experiments the following points seem evident:

1. no bud is opened in the jars 2, 4, 8, 10 in which there is no direct water-supply; in the dry and in a natural atmosphere;
2. relatively very few buds were opened in moist air and without direct water-supply. Opening of these buds happened later, as appears from the table;

¹⁾ KUIJPER, J. (1932). Zur Frage der periodischen Blüte von *Dendrobium crumenatum* Lindl. Rec. trav. bot. néerl. Vol. XXX, p. 1—22.

Condition \ Time	23th Aug.		24th Aug.		25th Aug.		26th Aug.		27th Aug.	Totals	
	6 p. m.	9 a. m. I	6 p. m. II	9 a. m. III	7 p. m. IV	10 a. m. V	7 p. m. VI	9 a. m. VII			
1. Dry air + water-supply	warmer (laboratory)	24.9-17.8-47-10.8	5 (4.5)	11 (10)	21 (19)	28 (25.5)	41 (37)	49 (44.5)	54 (50)	110	
2. Dry air, no water-supply			0	0	0	0	0	0	0		0
3. Ord. air + water-supply			3 (3)	5 (5.5)	6 (6.5)	11 (12)	14 (15.5)	30 (32)	40 (43)		93
4. Ord. air, no water-supply			0	0	0	0	0	0	0		89
5. Moist air + water-supply			2 (4)	5 (10)	6 (12)	12 (23)	18 (34)	29 (55)	37 (70)		53
6. Moist air, no water-supply			0	0	0	1 (1)	2 (2.5)	4 (5)	6 (7)		84
7. Dry air + water-supply	cooler (cellar)	17.0-15.0-80-11.5	1 (1)	4 (4.5)	6 (6.5)	8 (9)	16 (17.5)	19 (21)	28 (31)	91	
8. Dry air, no water-supply			0	0	0	0	0	0	0		131
9. Ord. air + water-supply			5 (6.5)	6 (8)	8 (10.5)	9 (12)	11 (14.5)	18 (24)	23 (30)		76
10. Ord. air, no water-supply			0	0	0	0	0	0	0		165
11. Moist air + water-supply			11 (8)	20 (14.5)	24 (17)	32 (23)	47 (34)	52 (38)	66 (48)		139
12. Moist air, no water-supply			0	0	0	1 (2)	4 (7)	10 (17)	17 (28)		60

(The four numbers in the narrow columns mean: temperature of dry thermometer, temp. of wet therm., rel. humidity and vapour pressure. The numbers of the last column are the totals of flower-buds or the spikes investigated. The other numbers in the columns are the flower-buds opened and within brackets the %'s of the whole number of the spike, $\pm 0.5\%$).

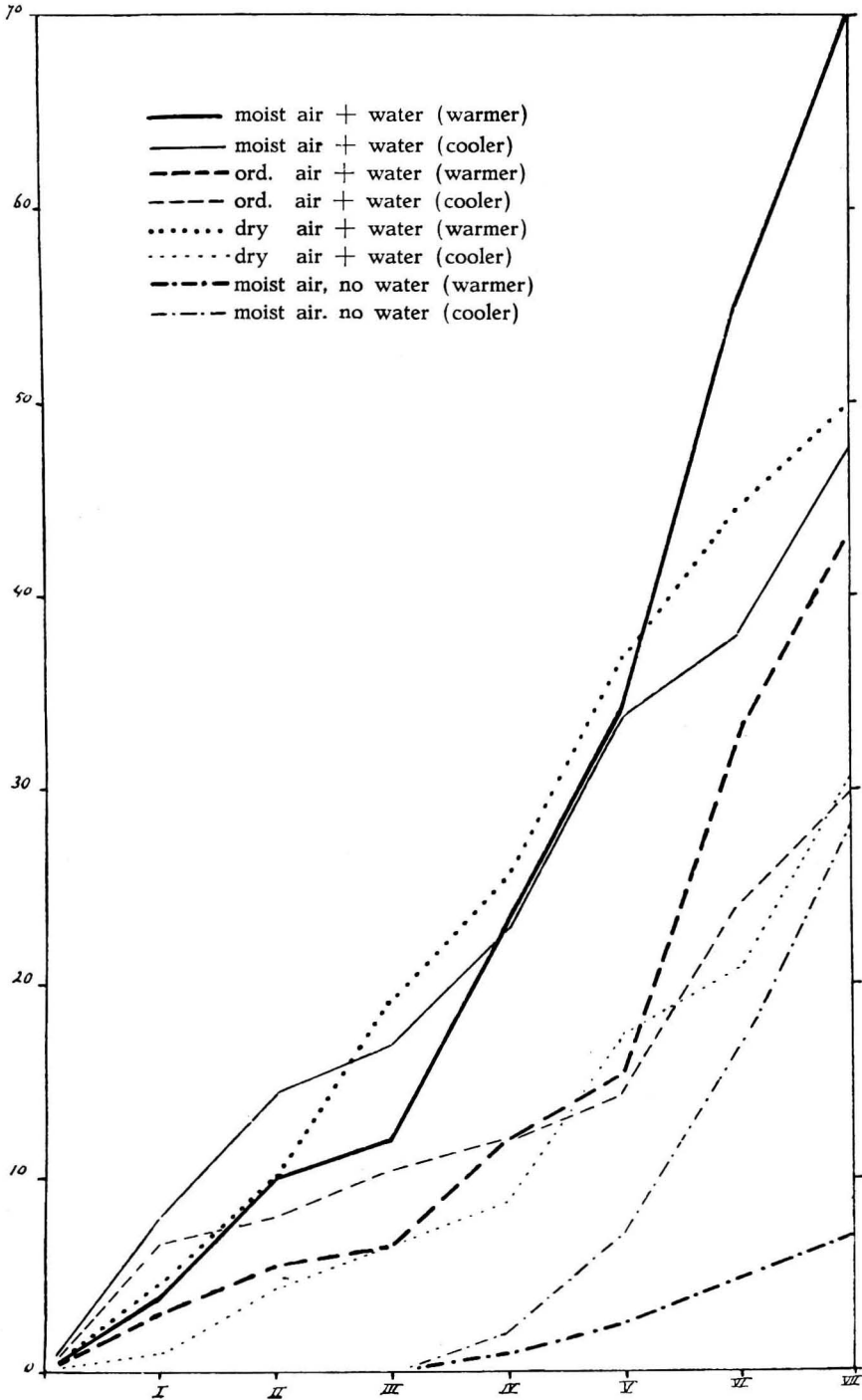


Fig. 1. Vertical: numbers of opened flower-buds in %.
 Horizontal: observation-times (see table).

3. from the other jars Nos. 5 and 1 with direct water-supply at higher temperature, show the highest number of flowers in a moist atmosphere;

4. the jars placed at lower temperature (thin lines on the figure) seem to lag behind when compared with the partners at higher temperature (heavy lines). An exception to this rule is formed by the case of humid atmosphere without direct water-supply. Here more buds are opened at low temperature.

The opening, if retarded, of the buds without direct water-supply in moist air may be an indication of a possible water intake from the atmosphere, which might be sufficient for the opening of the buds.

The total lack of flowering in dry and in atmospheric air without direct water-supply seems to confirm this point. The observations are in accord with those of Mr. and Mrs. BAAS BECKING. I am under obligation to the Misses N. and A. KRIJTHE for friendly assistance.

Wijster (Dr.), October 16, 1935.

Embryology. — *Gebiss- und Zahnentwicklung bei der Irisforelle (Salmo irideus)*. II. *Zunge*. Von B. VAN DER EYKEN. (Communicated by Prof. M. W. WOERDEMAN.)

(Communicated at the meeting of October 26, 1935).

Auf der Zunge der Irisforelle entwickeln sich ungefähr symmetrisch, zu beiden Seiten der Medianlinie, zwei Reihen Zähne, welche sich mit dem Zungenbein verbinden. An der Hand meiner Präparatenserie¹⁾ werden wir jetzt nachgehen, auf welcher Weise sich das Zungengebiss entwickelt.

Das Embryo *E* zeigt auf der Zunge beiderseits nur eine Zahnanlage, welche sich in einem jungen Papillenstadium befindet und kein Dentin enthält.

Im nächst älteren Stadium *F* sind links zwei Keime vorhanden, von denen der mesiale sich gerade erst angelegt hat und völlig dentinlos ist, während der distale Zahn, der ungefähr horizontal liegt und dadurch quer angeschnitten wurde, viel älter ist, in mehrere Schnitte zerlegt wurde und deutlich eine Dentinscherbe zeigt. Rechts von der Medianlinie ist der distale Zahn vorhanden, von der mesialen Anlage aber besteht nicht mehr als eine Andeutung in der Form einer kleinen Gemma. Es ist also auf der Hand liegend zu schliessen, dass der distale Keim dieses Stadiums homolog ist mit der Zahnanlage des Präparates *E*, mesial von welcher sich hier ein zweites Zähnchen angelegt hat. Es liegt hier also eine Gebissentwicklung in disto-mesialer Richtung vor.

¹⁾ Für Einzelheiten betreffs Grösse und Alter der Larven, und Weise der Untersuchung, sei auf die Proceedings Vol. XXXVIII, N^o. 8, 1935 verwiesen.