

Phyton (Austria)	Vol. 18	Fasc. 3—4	165—172	18. 5. 1978
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Studies on the Physiology of Abscission: Effect of Treatments with Chlorfluorenol-Methyl, a Morphactin

By

Alberto BIANCHI and Giannino LAUDI *)

Received May 11, 1977

Summary

Abscission of debladed petioles of *Coleus blumei* BENTH. after spray applications of chlorfluorenol-methyl (EMD-IT 3456) to the foliage has been investigated. Sprays were applied to some branches, which were left intact (inducing branches), or to an adjacent branch the leaves of which were later debladed (induced branch). In all the experiments two applications of morphactin were made, after which the induced branch was debladed. Treatments on the induced branch accelerated the petiole abscission in relation to the control. Treatments on inducing branches, however, decreased abscission speed of debladed petioles. The interaction of morphactin in auxin metabolism or interference with auxin metabolism were discussed.

Zusammenfassung

Die Abstoßung spreiteloser Blattstiele von *Coleus blumei* BENTH. nach Besprühen der Blätter mit Methylchlorfluorenol (EMD-IT 3456) wurde untersucht. Es wurden einerseits Zweige besprüht, die intakt belassen wurden (induzierende Zweige), andererseits ein benachbarter Zweig, dessen Blattspreiten später entfernt wurden. In allen Versuchen wurden zwei Morphactin-Behandlungen durchgeführt, nach diesen wurden am induzierten Zweig die Blattspreiten entfernt. Behandlung des induzierten Zweiges führte zu rascherem Abwurf der Blattstiele als bei den Kontrollen. Behandlung der induzierenden Zweige jedoch verzögerte den Abwurf der

*) Dr. Alberto BIANCHI, Prof. Dr. Giannino LAUDI, Istituto ed Orto Botanico, Università degli Studi di Modena, Viale Caduti in Guerra 127, I-41100 Modena, Italy.

spreitelosen Blattstiele. Eine Beteiligung des Morphaktins am Auxinstoffwechsel oder eine Beeinflussung desselben wird diskutiert.

(Editor)

Introduction

In a previous paper (LAUDI 1956) it was reported, that buds and leaves of some branches of *Coleus* (inducing branches) accelerated abscission of debladed petioles on another branch of the same plant (induced branch). Treatments with indoleacetic acid to debladed petioles of the induced branch delayed their fall.

On the contrary, treatments with ascorbic acid (a substance antagonist „in vivo“ of auxin, as demonstrated by TONZIG & MARRÉ 1961) to the leaves of the induced branch, before deblading, accelerated petiole fall. If treatments with ascorbic acid were performed on induced branch abscission was retarded (LAUDI & LAMBRI 1956).

MEDEGHINI-BONATTI, LAUDI & FRICANO (1975) demonstrated that the action of gibberellin on abscission of *Coleus* was different from that of auxin and ascorbic acid. Treatments with gibberellin, on leaves of inducing branches as well as on those of induced branch, accelerated abscission of debladed petioles of induced branch.

Recently SEVERI & LAUDI (1977) demonstrated the effect of some growth retardant chemicals (Phosfon D, CCC, AMO 1618) on abscission of petioles of induced branch.

Morphactins, a group of synthetic plant growth regulators, influenced plant morphogenesis, interfering with growth and modifying development by influencing the transport of growth substances in plants and by changing their action (MOHR 1969, SCHNEIDER 1970).

SCHNEIDER (1969, 1970, 1972) showed that morphactins can induce abscission of young, not fully expanded leaves, of floral buds, as well as of young flowers and fruits. WEAVER & POOL (1968, 1969) showed morphactin-induced abscission in fruits.

The effect of treatments with chlorfluorenol-methyl (EMD-IT 3456), carried out on inducing branches or induced branch, on the abscission of debladed petioles of induced branch was studied.

Materials and methods

Vegetatively propagated plants of *Coleus blumei* BENTH. were used in experiments carried out from July until August in a not-thermoregulated greenhouse.

When the young plants had grown up to 15 cm, the apical buds were removed for better sprouting. After two weeks, many lateral branches were removed, with the exception of four branches at two consecutive nodes.

The plants (about 40 cm high) were ready for treatments when 8–10 leaves were fully expanded on each branch. Three of the four branches on each plant were chosen as „inducing branches“: all leaves and apical and axillary buds were left intact on them. The „induced branch“ was the fourth branch of each plant, from which all the axillary buds and, at the end of the treatment, even the apical bud and the blades of all the leaves were cut off. In preliminary tests, the petioles abscised within 70–80 hours.

The chlorfluoreno-methyl (EMD-IT 3456), kindly given us by Celamerck as CME, a formulated product (containing 5% morphactin) particularly suitable for treatments on leaves, was emulsioned at various concentrations: a few drops of Tween 80 were added to the emulsions as a wetting agent.

The leaves of the inducing branches or, in turn, those of the induced branch (before deblading) were sprayed with the various solutions until running. The branches excluded from treatment were covered in order to prevent the solutions from reaching the leaves and further precautions were taken to prevent some of the solution from reaching the soil in the pots. Leaves were sprayed twice at a interval of 12 hours between two treatments. Apical buds and leaf blades of the induced branch were removed 20 hours after the last treatment. Abscission was tested, at convenient intervals, by slight pressure to the middle portions of a debladed petiole.

Treatments were carried out on 15 or 20 plant groups and the experiments repeated twice at least. Levels of significance of the results were obtained on STUDENT'S *t* treating the data of groups of plants sprayed with morphactins against the ones of the control.

Results

a) Effect of treatments with chlorfluoreno-methyl on the induced branch

Treatments with morphactin CME at concentrations of 10 mg/l, 50 mg/l and 100 mg/l to the leaves of the induced branch (before deblading) always resulted in an accelerated abscission of debladed petioles. Figure 1 shows that, 12 hours after deblading, the abscission percentage was different in the groups of plants: 2,5% in the control, about 12, 19 and 57% in the groups treated with 10, 50 and 100 mg/l of CME respectively. 24 hours after deblading similar differences in abscission were observed: in the control group the abscission percentage was 53, while in the group treated with 10 mg/l Morphactin the abscission percentage was 69, with 50 mg/l 92 and with 100 mg/l about 96 respectively. After 36 hours the following differences were observed: 78 in control group, 82 in the group treated with a solution of 10 mg/l chlorfluoreno-methyl, 96 and 100% in those treated with solutions of 50 and 100 mg/l respectively. Thus, on the basis of these experiments as well as of other ones similarly carried out in order

to check the results, treatments with chlorfluorenlmethyl on an induced branch caused a substantial acceleration of abscission of the debladed petioles. The effect of the morphactin was insignificant with the lower concentration and increased in accordance to rising concentration of the solutions. The levels of significance at the end of the experiments are 70% for the group sprayed with 10 mg/l, 99% for 50 mg/l and better than 99% for 100 mg/l.

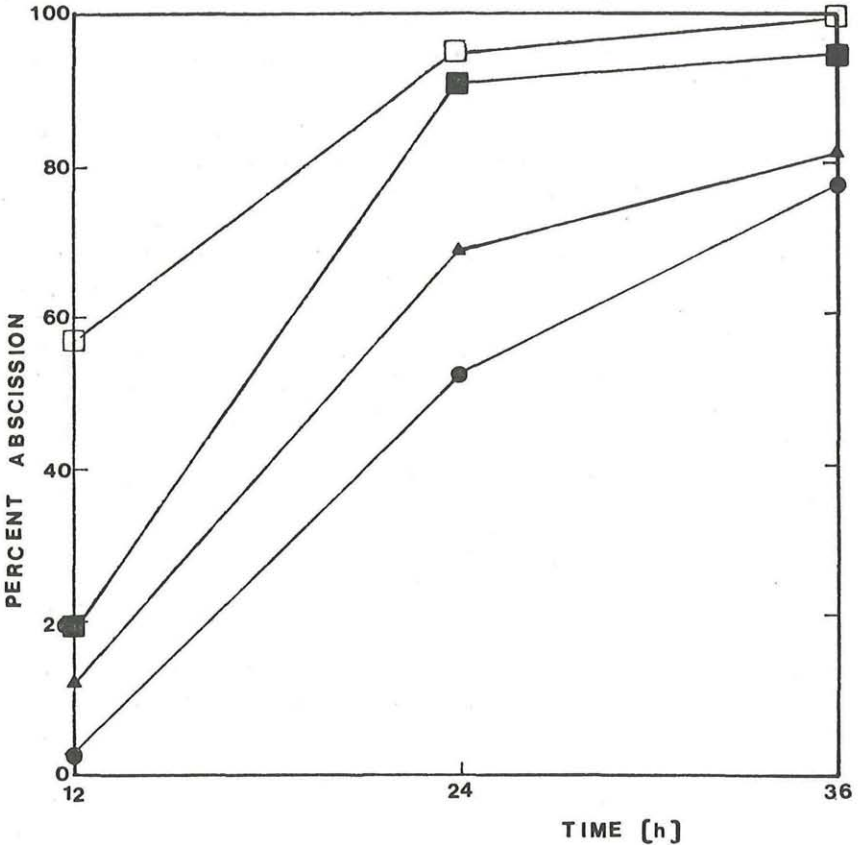


Fig. 1. Spray applications made to the induced branch (prior to deblading and apical bud removal).

Time course of petiole abscission after two spray applications of morphactine at various levels at 12 h intervals. The horizontal axis indicates hours from the time of deblading. Points representing data relative to 10 mg/l morphactine are shown as triangles, (▲-▲), 50 mg/l as black squares (■-■), 100 mg/l as empty squares (□-□); points for control data are shown as black circles (●-●).

b) Effects of treatments with chlorfluorezol on inducing branches.

Treatments with various solutions of CME on inducing branches presented results very different from those obtained by treating the induced branch: the speed of debladed petiole fall was very similar to that of the control (Figure 2).

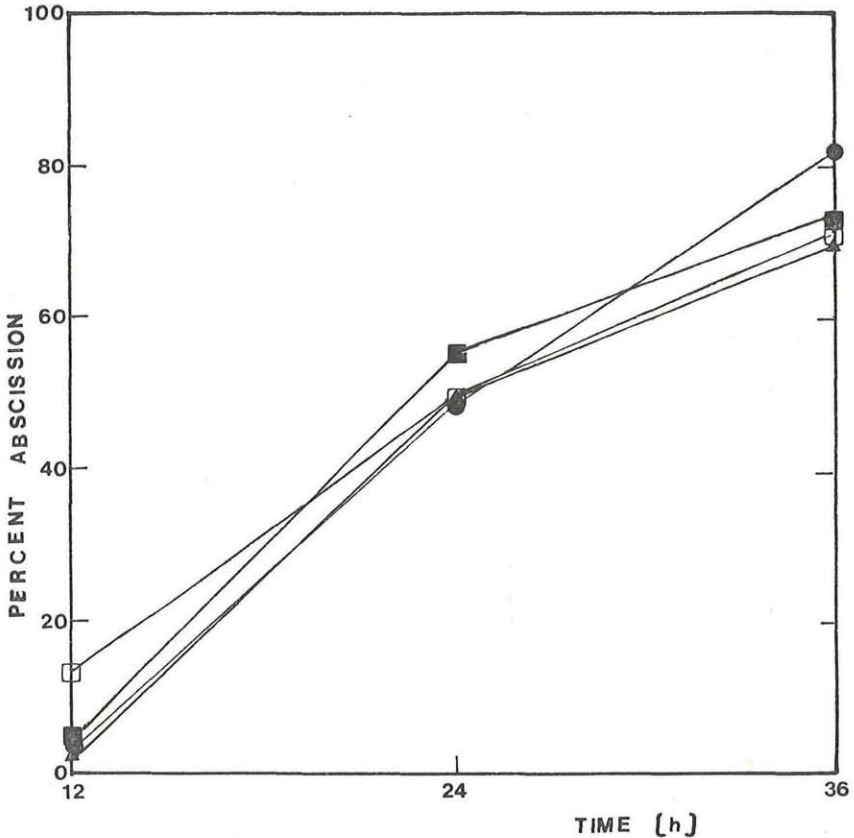


Fig. 2. Spray applications made to inducing branches. Otherwise as figure 1.

The abscission percentage in control groups and in those treated with different morphactin solutions showed differences without any statistical significance.

In another experiment, deblading of leaves and apical bud removal of the induced branch were delayed four days after the last treatment, carried out with 50 and 10 mg/l only.

Figure 3 shows the results of the experiment: 12 hours after deblading following percentages of abscission were obtained: in the control group 22,5%, in the group treated with 50 mg/l of chlorfluorenl-methyl 19% and with 10 mg/l 0%.

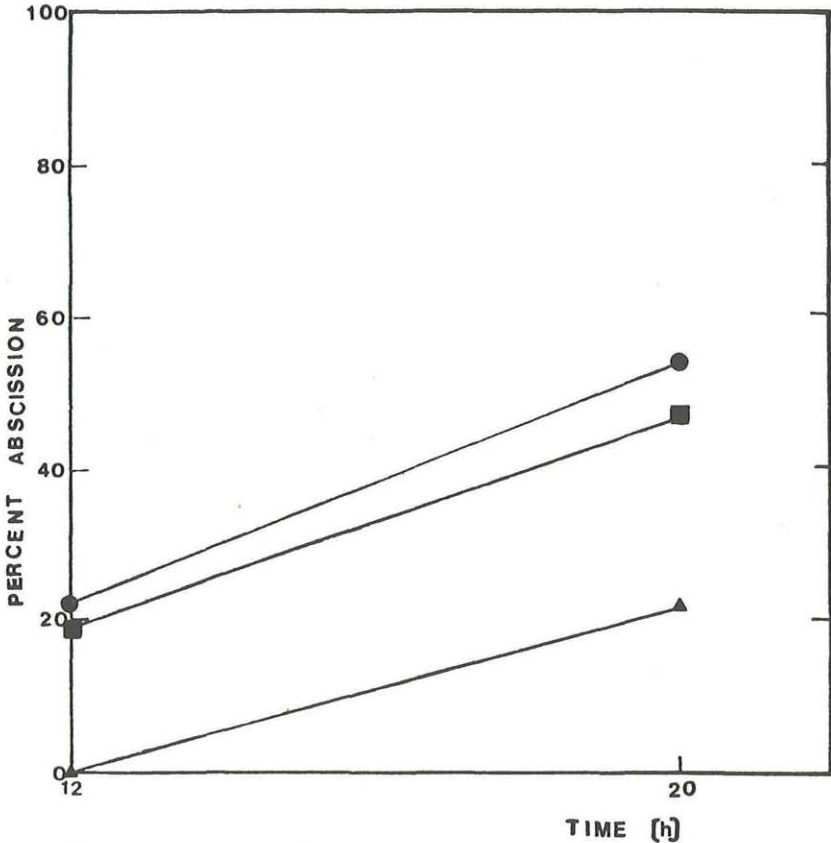


Fig. 3. Spray applications made to inducing branches. Deblading at fourth day. Otherwise as figure 1.

20 hours after deblading the abscission percentages were: control 53%, 50 mg/l 47%, 10 mg/l 21,5% (the variation in the control depends on the seasonal variations in a not-thermoregulated greenhouse). In this experiment, treatments with morphactin on inducing branches produce a decrease in the abscission of debladed petioles of the induced branch more remarkable for the 10 mg/l solution than for treatment with more concentrated solution. Levels of significance at the end of this experiment were found to be better

than 99% for the treatment with 10 mg/l morphactin and 75% for the other one with 50 mg/l.

Discussion

Treatments with chlorfluoreno-methyl on the induced branch result in petiole abscission faster than in the control. Many of the cited authors have demonstrated that chlorfluoreno-methyl influences activation of auxin and decreases auxin effect. Morphactin may cause the accelerated abscission influencing the content of auxin in the petiole, that is in the distal side of abscission zone.

Treatments with chlorfluoreno-methyl on the inducing branches have an effect scarcely significative, but opposite to the petiole fall of the induced branch; if deblading was retarded, treatments on inducing branches decrease the petiole fall. The not polar transport of the morphactin and its effects influencing activation of auxin can explain the various effects of treatments on inducing branches.

The results seem to be of interest as they show the action of chlorfluoreno-methyl on abscission depending on influence in the growth substances, but also through interference with metabolism and perhaps with transport of auxin.

Acknowledgements

We thank Prof. G. SCHNEIDER for his useful suggestions and kind collaboration.

References

- LAUDI G. 1956. Studi sulla fisiologia dell'abscissione: influenza della presenza di rami normali, foglie e gemme ascellari sull'abscissione di piccioli privati del lembo. — N. Giorn. Bot. Ital. 63: 204—212.
- & LAMBRI L. 1956. Studi sulla fisiologia dell'abscissione effetti di trattamenti capaci di potenziare o di indebolire l'azione auxinica nella parte perennante o nella parte caduca. — N. Giorn. Bot. Ital. 63: 324—335.
- MEDEGHINI-BONATTI P., LAUDI G. & FRICANO G. 1976. Studies on the physiology of abscission: effect of treatments with gibberellic acid. — Amer. J. Bot. 63: 135—137.
- MOHR G. 1969. Morphaktine, eine neue Gruppe von Wachstumsregulatoren, ihre Chemie und Biochemie. — Ber. dtsh. bot. Ges. Neue Folge. 3: 5—18.
- SCHNEIDER G. 1969. Morphaktine, Wirkung auf Entwicklung und Wachstum von höheren Pflanzen. Ber. dtsh. bot. Ges. Neue Folge 3: 19—41.
- 1970. Morphactins: Physiology and performance. — Ann. Rev. Plant Physiol. 21: 499—536.
- 1972. Morphactins and plant growth regulation. Hormonal regulation in plant growth and development. — Proc. Adv. Study Inst. Izmir. 317—331.

- SEVERI A. & LAUDI G. 1977. Studies on the physiology of abscission: effect of treatments with growth retardant chemicals on petiole abscission in *Coleus*.-Physiol. Plant. 41: 155—157.
- TONZIG S. & MARRE' E. 1961. Ascorbic acid as a growth hormone. Pl. Growth Regulation. — Iowa State University Press. 46: 725—734.
- WEAVER R. J. & POOL R. M. 1968. Induction of berry abscission in *Vitis vinifera* by morphactins. — Am. J. Enol. Viticul. 19: 121—124.
- — 1970. Effect of ethrel, abscisic acid, and a morphactin on flower and berry abscission and shoot growth in *Vitis vinifera*. — J. Amer. Soc. Hort. Sci. 94: 474—478.

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Jahr/Year: 1978

Band/Volume: [18_3_4](#)

Autor(en)/Author(s): Bianchi Alberto, Laudi Giannino

Artikel/Article: [Studies on the Physiology of Abscission: Effect of Treatments with Chlorofluorenol-Methyl, a Morphactin. 165-172](#)