Seed Germination of *Daphne mezereum*: Fruit Stages, Cold Treatment, and More©

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INTRODUCTION

Daphne mezereum (February daphne) is one of few *Daphne* species which can set a lot of seeds in the fall. In 1998, Michael Dirr from the University of Georgia visited the Lyle E. Littlefield Ornamentals Trial Garden at the University of Maine and indicated that the low germination of *Daphne* seed was not fully understand. Actually, the two plants in our garden produced abundant seeds every other year; however, no seedlings have been found around the plants and adjacent areas for the last 6 years. In Fall 1998, seeds were collected and a seed germination experiment was initiated to improve germination of *D. mezereum*.

February daphne is a great garden plant for early flowering in spring. The dense purple-flowering branches have great potential for cutting flower production. In the winter, the rounded and low-growth habit (at least in our gardens), with loaded flowering buds, brings a lot of attention above the snow line. Although there is an abundance of red fruits in fall, the dull, yellow-brown foliage usually turned garden lovers away. Also, reproduction difficulty and poor fall performance have contributed to the low popularity of *D. mezereum* in our gardens.

Most *Daphne* species are propagated by stem cuttings because so few of them produce seeds (Deno, 1996; Gaschk, 1989). Also, low and unstable germination rates reduced interests of commercial propagators. Carter (1979) indicated that stages of fruit ripeness, mechanical treatment, and soaked in water or gibberellic acid had great influences on seed germination rates of *D. mezereum*. Green fruits had better germination rates than red fruits. Vigorously germination of rubbed mature seeds reached 79% compared to 17% for untreated seeds. Germination was also much greater (up to 69%) if the seeds were soaked in water; gibberellic acid did not improve this germination percentage. Deno (1996) indicated that for two cycles of cold-warm temperatures (40 to 70°F) resulted in germination of 74% of *D. mezereum* seed compared to 26% for one cycle. In this study, the effect of cold treatment on *D. mezereum* seed germination of seed extracted from fruit at two stages of maturity was studied.

MATERIALS AND METHODS

Fresh red berries (picked from the plants) and black dry berries (picked from the ground) of *D.mezereum* were collected from two plants in the Lyle E. Littlefield Ornamentals Trial Garden in Orono, Maine on 16 Sept. and 5 Oct. 1998, respectively. Both fresh and dry fruits were soaked in water for 2 to 5 days to remove the pulpy matrix around the fruit. The cleaned seeds were air-dried for a week, then stored at 41°F in a refrigerator for more than a month. On 15 Nov., seeds were layered in wetted sphagnum moss and stored at 41°F for 1, 2, 3, or 6 months.

Seeds for control treatments (no cold) were directly sowed in 1-gal containers with sand and commercial potted mix (1 : 3, v/v) on 15 Nov. All seeds were placed on the

top of medium mix, then covered with about 1 cm of pure sand. The same procedures were applied to all other seeds with cold treatments. All containers were placed in a heated greenhouse at University of Maine campus.

A completely randomized design was employed in this experiment. Containers were rotated around the greenhouse every 2 months to ensure complete randomization. There were six replicates for each treatment and each replicate (container) contained 20 seeds. A total of 120 seeds was used for each combined treatment of cold treatment and fruit stage. Germination began in April 1999 and number of seedlings per container were counted monthly from 30 June to 30 Nov. 1999, after which no new seedlings were observed. Data were tested using an analysis of variance and Tukey's Studentized Range (HSD) Test ($P < 5\%$).

The second trial utilized 27 seeds from fresh red fruits. All seeds were stored at 41°F in the wetted sphagnum moss for 2 months. Seeds were not sown directly in media, but were kept at room temperature in the wetted sphagnum moss. After 45 days at room temperature, 100% radicle emergence was observed. The germinating seeds were planted about 1 cm deep in a commercial pot mix (Fafard Mix No. 3B, Agawam, MA) in a 32-cell flat (Dillen Products, Inc., Middlefield, OH). In this seed trial, only six out of 27 seeds developed to the seedling stage. Although this experiment was not replicated, the results indicated that rapid seed rot (external infection) after contacting with moisture and media was an important factor limiting *Daphne* seed germination. Further study is needed to better understand the relationship between seed germination and germination media.

RESULTS AND DISCUSSION

Fruit stage significantly influenced seed germination of *D. mezereum*. Fresh red fruits had much higher germination compared to dry black fruit (Table 1). We conclude from the results of Carter(1979) and those presented here that germination decreases as the fruits matured and changed from green, to red, and then black. Obviously, there are some inhibitors that are developing during the fruit maturation. If the inhibitors are water soluble, they can be removed by soaking or other chemical, physiological, and mechanical treatments (Dirr and Heuser, 1987).

Table 1. Effect of fruit stage and cold treatment on seed germination rates (%) of *Daphne mezereum*.

	Cold treatment (month)				
Fruit Stages	0	1	2	3	6
Fresh Red	38.3de*	82.5a	65.0b	58.3cb	43.3d
Dry Black	15.0f	50.0cd	46.7cd	25.0ef	20.0f

* significant different at $P < 5\%$

Cold treatment is a common method to break seed dormancy. After a period of cold and moist conditions, the inhibitors in the seeds are usually degraded. Seeds subjected to cold treatment had significantly higher germination compared with no

cold treatment (Table 1). One-month cold treatment produced much better germination than longer cold durations. However, both 2- or 3-month-cold treatment also significantly increased germination compared to more. As the cold period was lengthened, the germination rate decreased regardless of fruit stages.

Although no significant interaction between fruit stages and cold treatment was observed, both fruit stages and cold treatments had a significant effect on *D. mezereum* seed germination. If we collect fresh red fruit, remove the pulpy matrix first, then subject the seeds to an 1-month-cold treatment at 41°F, we can attain good germination.

CONCLUSION

Fresh red fruits have better germination rates compared to black dry fruits. A 1- or 2-month-cold treatment at 41°F not only increased germination rate, but also resulted in more uniform germination (data not presented). Besides effects of fruit stages and cold treatment, seed germination of *D. mezereum* may also be influenced by germination media. Further investigation should be carried out to address this problem.

LITERATURE CITED

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