VERMICOMPOST AND COIR ENHANCE GERMINATION OF *ECHINACEA PURPUREA*

by Michelle Wills and Gary R. Bachman, Tennessee Technological University

The horticulture industry is always looking for alternative soilless media components. Earthworm casts and coconut pith are two such materials. Earthworms casts or vermicompost (VC) have long been reported to have beneficial effects on plant growth. Charles Darwin conducted extensive research on VC and plant growth (2). Addition of vermicompost to soilless media is reported to improve water holding, nutrient content, and enhance seed germination and development through the action of plant hormone-like substances (3, 6). Growth increases up to a 40% have been reported for *Tagetes patula* and *Solanum lycospersicon* (1) while *Juniperus communis, Chamaecyparis lawsoniana, and Elaeagnus pungens* had up to 50% greater growth (4) with the addition of VC in the growing media.

Coconut pith or coir is the waste material left after the long fibers have been removed from coconut husks and is considered a viable substitute for peat. It is similar in appearance and physical properties such as water holding and drainage. Use of coir in growing media is reported to affect seed germination of woody plants. Germination percentages of *Magnolia, Rhamnus, and Callicarpa* were greater in 100% coir media versus coir media amended with perlite/vermiculite or a commercial peat-based media (5). The objective of this research was to evaluate the germination effects of vermicompost amended coir media on *Echinacea purpurea* 'Bravado' seed having varying viability.

Three sources of varying viability of *Echinacea purpurea* 'Bravado' seed were used for the experimental purposes. Seeds were field-collected in 1998 and 1999 and were stored in paper bags at room temperature. Additionally, commercial seed was purchased (Park Seed Company, Greenwood, SC) and was considered stored in optimal conditions. Seed viability from each seed source was determined. Paper towels were moistened and 25 seeds from each source were placed on the towels and rolled. The "ragdolls" were put in plastic bags and placed in a 28C (82F) incubator. This was replicated four times. Germination was determined at 7, 11, and 18 days after treatment (DAT). After 18 DAT, the germination percentages were 79%, 67%, and 1% for the commercial, 1999 field-collected, and 1998 field-collected seed, respectively. This resulted in seed viability treatments being high, medium, and low.

The growing media was coir-coconut fibers (Crystal Company, St. Louis, MO) and vermiculite mixed at three different formulations: 100% coir, 90/10% coir/vermiculite, 70/30% coir/vermiculite. Half of each coir/vermiculite formulation was amended with vermicompost at 10% by volume. This resulted in six different media formulations. Seed from each seed source was sown into each media formulation using 128 plug trays. Germination was checked daily beginning seven days after placing plug trays under mist system. Seeds were considered germinated when cotyledons had fully emerged from the media. Daily counts continued for twenty-four days after treatment initiation.

Seed germination rates of the three seed sources were established across all treatments. The Park seed lot had the highest germination rates followed by the 99 field collected and the 98 field-collected. These germination results were corroborated by the ragdoll germination tests that were performed on the seed lots.

The addition of vermicompost had a significant effect on the seed germination of all three seed sources (Table 1 - page 22). Twelve days after initiation, VC amendment increased germination for 1998 field-collected (100% coir), 1999 field-collected (100%coir, 90/10 coir/vermiculite) and commercial seed (100 coir, 90/10 and 70/30 coir/vermiculite). At the project conclusion, 24 DAT, germination was increased in 100% coir and 90/10 coir/vermiculite amended with VC for all three seed sources.

There were germination differences between the three media formulations. For the 1998 and 1999 field-collected seed, the 100% coir and 90% coir-10% vermiculite formulation had significantly greater germination than the 70% coir-30% vermiculite (Table 2 - page 22). However, germination of the Park seed was significantly greater in 90% coir-10% vermiculite and 70% coir-30% vermiculite when compared to the 100% coir.

Though the 1998 field collected seeds had extremely low germination, the addition of vermicompost or higher percentages of coir did promote greater germination. This is important when considering seeds that have low viability, whether from improper storage or natural causes. Germination percentages of other plant species seeds having inhibited viability may be increased with the addition of vermicompost and/or coir fiber to the growing media. More research needs to be conducted to further elucidate the effects of vermicompost and coir on seed germination.

Literature Cited

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Table 1. Germination of *Echinacea purpurea* 'Bravado' seed of differing viability in three coir-based media formulations amended with vermicompost 12 and 24 days after treatment initiation.

	1998 Seed		1999 Seed		Commercial Seed	
Media Formulation	12 DAT	24 DAT	12 DAT	24 DAT	12 DAT	24 DAT
100% Coir	0 b[z]	0 b	41 b	64 b	25 c	56 b
100% Coir + VC	4 a	6 a	64 a	85 a	55 b	80 a
90%Coir/10%Vermiculite	0 b	1 b	39 b	67 b	41 b	65 b
90%Coir10%Vermiculite + VC	0 b	5 a	67 a	82 a	79 a	91 a
70%Coir/30%Vermiculite	0 b	2 b	32 b	62 b	29 c	77 ab
70%Coir/30Vermiculite + VC	1 b	2 b	24 b	59 b	67 a	87 a

[z]Mean separation within columns by least significant difference (LSD), P=0.05.

Table 2. Mean germination of *Echinacea purpurea* 'Bravado' seed of differing viability in three coir-based media formulations regardless of vermicompost amendment.

	Seed Viability Treatments		
Media Formulation	1998	1999	Commercial Seed
100% Coir	2.1 a[z]	56.7 a	46.9 b
90%Coir/10%PV	1.6 a	54.3 a	62.9 a
70%Coir/30%PV	0.9 b	39.5 b	60.4 a

[z]Mean separation within columns by least significant difference (LSD), P=0.05.