The Effect of Peat-moss Extracts on Seed Germination

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Peat-moss—the partially decomposed remains primarily of *Sphagnum* species—is a standard potting material for several classes of plants as well as being the preferred medium in the moist cold treatment (stratification) of the seeds of many types of ornamental and forest tree species. During stratification a seed may double its weight by imbibing what is essentially an aqueous steep of the surrounding peat-moss.

Gardners, nurserymen, and others have long held that contact with peat-moss may actually improve seed germination and early root growth and that the peat-moss may have fungicidal properties as well. The vegetal origin of peat-moss, of course, suggests it to be able to supply a wide range of inorganic and organic compounds to its surroundings. Furthermore, certain reports in the scientific literature provide support for the observations that have been made, among them the following.

On the basis of both straight-growth and root-initiation bioassays, Niggemann (2) reported aqueous extracts of peat-moss to contain growth promoting and inhibiting substances, including indoleacetic acid. Additionally such extracts appeared to contain the enzymes required to convert tryptophan to indoleacetic acid. They were also found by him (3, 4) to contain oestrus-stimulating compounds, these perhaps coinciding with the plant growth inhibitors he had described previously. Niggemann (2) also referred to other reports in the literature of peat-moss containing a variety of growth stimulators, oestrogens, and antibiotics. Recently Pokorná (5) demonstrated catalase activity in peat-moss derived from Sphagnum palustre L. Květ (1) found that the water-soluble components of peat-moss promoted the growth of the alga Chlorogonium euchlorum Ehrenberg.

The various indications that peat-moss is capable of supplying growth-influencing substances to its surroundings led us to observe the possible effect of a peat-moss steep on the germination of certain seeds.

Materials and Methods

The seeds of two divers species were tested: lettuce (Lactuca sativa L. cv. Grand Rapids) and jack pine (Pinus banksiana Lamb.). All germination tests were performed in blocks of 50 seeds which were placed dry on a substratum of six thicknesses of Whatman No. 1 filter paper in covered 9-cm. petri dishes. Each dish was moistened with either 10 ml. of distilled water or test solution. The design, number of replications, and general procedure made the results amenable to statistical analysis. Incubation was carried out at ca. 22°C; continuous dim red light (wave lengths longer than ca. 660mµ) was provided for the satisfaction of any light requirements. Prior to incubation the jack pine seeds were maintained at ca. 5°C for 72 hours in their moistened petri dishes.

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The steep tested was obtained by immersing 428 gm. of air-dry peatmoss (Detorf Co., Bremen, West Germany) in 3,500 ml. of distilled water, an amount just sufficient to cover it. The peat-moss was permitted to soak for 96 hours at ca. 4°C, after which the steep was filtered through Whatman No. 5 paper. A portion of this steep was concentrated tenfold under reduced pressure. One milliliter of test solution was thus derived from either 0.12 or 1.2 gm. of peat-moss. The pH value of the weaker solution was 4.3 and of the stronger 3.7. Such differences in pH value were found in preliminary tests to have no significant effect on the germination of the seeds used.

Germination percentages were obtained after four days of incubation for lettuce and after seven for pine, the results thus reflecting primarily total germination rather than rate of germination.

Results

The lettuce seeds that were provided with water alone exhibited 86% germination; an analysis of variance showed that the germination of the seeds permitted to imbibe either concentration of the peat-moss steep was not significantly different. The results are summarized in Table 1.

In the case of the jack pine seeds, the treatments did have a marked stimulatory influence. While control germination was 26%, imbibition of the less concentrated steep resulted in 33% germination, and imbibition of the more concentrated steep 48%. An analysis of variance followed by Tukey's comparison of means demonstrated each of the three values to be significantly different from the other two at the 1% level. These results are also summarized in Table 1.

TABLE 1. Effect of imbibed peat-moss extract on seed germination

Concentration

	Concentration	
	\mathbf{of}	
	Imbibed	
Species	Steep	Germination
	(gms/ml)	(%)
Lactuca sativa	0	85.5
	0.12	90.9
	1.2	86.3
Pinus banksiana	0	25.8
	0.12	32.6
	1.2	47.8

In this connection, the data of Rubtzov (6) show that the soaking of Scotch pine (*Pinus sylvestris* L.) seeds for two to five weeks in water collected from a *Sphagnum* bog increasingly inhibits their subsequent germination, but suggest that a five or ten day soak may increase the rate and final percentage slightly.

Conclusion

It has been shown that substances can be steeped out of peat-moss which are capable of influencing the germination of some seeds. Thus when the porous, moisture-holding properties of peat-moss are taken

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advantage of to supply water and air to plants being propagated, one must recognize that the peat-moss may be influencing the propagules in more subtle ways as well.

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