

# Sodium concentration in germination blotters

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## Abstract

Walter filtrate from blue germination blotters was analyzed by atomic absorption spectrophotometry and found to contain 509 ug of Na<sup>+</sup>/g of blotter. Since this is a sufficient concentration to confound the results of some studies of seed germination and seedling growth, researchers need to be aware of this potential bias. The findings emphasize the necessity for documenting the quantity of cations present in medium used in germination and seedling growth evaluations.

**Key Words:** germination paper, sodium, research methods

Seeds of many species are studied each year to determine the optimum conditions for germination and growth. Many of these experiments use some form of absorbent paper for the germination medium. While conducting studies with antelope bitterbrush seeds [*Purshia tridentata* (Pursh) DC], we detected an unexpected increase of 260 ug/g in embryo Na<sup>+</sup> for seeds stratified on steel blue seed germination blotters from Anchor Paper Company, St. Paul, Minnesota<sup>1</sup>. To determine if the blotters were the source of Na<sup>+</sup>, the Na<sup>+</sup> concentration was measured in 6 randomly selected blotters from a quantity received in January 1986. Blotter subsamples (1 g) were soaked in 100 ml deionized water at room temperature for 24 hours. The solution was then filtered through Whatman number 40 filter paper and the filtrate analyzed for Na<sup>+</sup> by atomic absorption spectrophotometry. Total Na<sup>+</sup> in the filtrate was divided by the dry weight of the blotter sample and expressed as ug of Na<sup>+</sup> per g of blotter paper. The Whatman number 40 filter paper was analyzed by the same procedure. The analysis indicated a Na<sup>+</sup> concentration in the blotter paper of 534 ug/g (SD = 14.5). Sodium in Whatman number 40 paper averaged 25 ug/g and ranged from 16 to 35 ug/g, resulting in an average of 509 ug Na<sup>+</sup>/g of germination blotter.

The consequences of Na<sup>+</sup> contamination in germination paper depend upon the experimental methods, the species, and the germination or growth variables being tested. If a two-gram blotter contains 500 ug Na<sup>+</sup>/g blotter and is used with 10 ml of deionized water, the Na<sup>+</sup> concentration of the imbibed solution would be about 100 ug/ml. If 2 blotters are used with 10 ml, and if half of the 10 ml evaporates, the seeds will then have been exposed to a solution concentration that might contain 400 ug Na<sup>+</sup>/ml of solution. (This is approximate since we do not know how tightly Na<sup>+</sup> is held by the cellulose fibers of the blotters.)

No effect of blotter Na<sup>+</sup> on germination or on seedling growth of bitterbrush was detected under conditions similar to the second example above; however, blotter Na<sup>+</sup> has mitigated the significant ( $P \leq 0.05$ ) negative influence of polyethylene glycol seed treatments on the growth of mountain mahogany [*Cercocarpus montanus* (Raf.)] seedlings (Morgan 1988). Studies which have not used blue blotters also provide evidence that Na<sup>+</sup> can pass through seed integuments to enter the seed. Sharma (1973) presented evidence that NaCl will enter seeds of *Trifolium*, *Lolium*, *Danthonia*, and

*Atriplex* and that it will affect the rate and total germination. A concentration of 500 to 1,000 ug Na<sup>+</sup>/ml of imbibed solution has been found to enhance germination and seedling vigor of winterfat [*Eurotia lanata* (Pursh) Moq.] (Hilton 1941, Booth 1989, 1990). Similar information has been reported for other chenopods (El-Sheikh and Ulrich 1970, Romo and Haferkamp 1987, Eddleman and Romo 1987). The level of Na<sup>+</sup> found in steel blue seed germination blotters could influence the results of some studies. Therefore when conducting germination and seedling growth research, it can be important to document levels of cations present in the germination medium or in the solution imbibed by the seeds.

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## Appendix

The findings reported in this paper were previously discussed with people at Anchor Paper Company, who then contacted their supplier, James River Corporation, to express concern over the level of Na<sup>+</sup> in blue germination blotters. James River Corporation explained that in the past, sodium has been added to insure color fastness. They have changed dyes and have advised Anchor Paper Company that as of August 1989, sodium will no longer be added to the germination paper.

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<sup>1</sup>Company name and production description are given for information only.