QUICK METHODS OF DETERMINING VIABILITY

by

E. E. Hardin

Director, Seed Laboratory
Oregon State University, Corvallis, Oregon

Tree seed testing is primarily that of determining the quality of a lot in question. Seed laboratories during the past fifty years have obtained this value by providing the seeds with what they consider optimum germination conditions for a given number of days. Those seedlings having all the essential structures necessary to develop into a mature plant are considered normal. During the past fifty years the opinion has developed that this germination percent obtained from the laboratory can be directly applied to the field. This Is not entirely true since optimum conditions are rarely if ever obtained in the field. A seed laboratory could not predict field germination since it is impossible for them to know which field is being considered for planting. Fields vary in acidity, fertility, moisture, heat, etc., to the point that any estimate would be purely a guess without specific knowledge of the soil and its past performance. Seeds can be placed under certain stress conditions which provides information about the vigor of the seed. This helps by giving a performance value under adverse conditions but still does not relate directly to the field. Information provided by optimum conditions can be helpful since some knowledge of the field condition and past history is usually known.

Optimum conditions used by seed laboratories have been developed by experience and research. For years the only reference to tree seed germination conditions was the Wood Plant Manual. Oregon State University with the help of the Western Forest Tree Seed Council developed methods for testing seeds of the Pacific Northwest during the middle 1950's. More recently the Association of Official Seed Analysts have printed a set of rules which incorporates the best known rules available at this time.

There are other methods for testing viability of seed which are faster and may in some instances give additional information as to the value of tree seeds. Oregon State University offers a number of these tests for the convenience of those requesting such service.

The Tetrazolium Chloride Staining Test is one of these quick viability tests which is being used to a considerable extent today. Live tissues of seeds will stain red when subjected to this clear solution. By critically examining the extent and intensity of the red stain a trained technician can soon provide results which correlate closely with a germination test. This test is accomplished within 48 hours. It is a

difficult, tedious, time-consuming operation and consequently becomes expensive in terms of one's time. General rules and techniques have been developed by the Association of Official Seed Analysts. These are published in a handbook by the Association. Specific methods for tree seeds are not included in this publication. Some laboratories in the United States and Europe, including Oregon State University, have established procedures which give good results. Recent work being conducted by Rodger Danielson of the Oregon State University Seed Laboratory indicates that a new technique being developed by him may correlate more closely to actual germination tests than have previous techniques. In addition to results in a hurry this test will provide a double check on questionable germination, indicate viability where germination methods have not been developed, provide viability of dormant seed not available in standard germination.

The Excised Embryo Test is another method whereby information can be obtained on the potential germination of seeds. The seed is opened and the embryo removed from the endosperm. The embryo is placed on media and allowed to elongate. The amount of embryo extension as well as its general condition can give an indication of the ability of that embryo to produce a normal seedling. This test can be done in eight days and can correlate with germination within reasonable limits.

Another growth test which has been around for quite some time is the Hydrogen Peroxide Test. A portion of the seed is removed near the root tip to allow peroxide to enter that portion of the seed. The hydrogen peroxide stimulates rapid elongation of the root through the cut portion of the seed and can be evaluated as to its potential in producing a normal seedling.

X-ray has been studied in recent years to determine its value in estimating the viability of seed. It can produce valuable information which can be of interest or value to the individual if used in the proper way. The x-ray allows the opportunity to view the internal structures of the seed to determine if all the essential parts are present within the seed coat. Internal cracks and breaks in the seed coat as well as to the embryo are visible. Insect injury, pitch-filled seeds, or immature embryos are readily discernable by this technique. It has certain limitations because dead seed cannot be observed on the radiogram.

If the seedsman is knowledgeable of the tests that are available to him and has an understanding of what each test will provide he then can be more knowledgeable about the seed he is using. Not all tests are appropriate on each lot of seed but sooner or later anyone handling seed will eventually run upon a lot where the results do not seen to fit the expectation or more information concerning the nongerminants are necessary. Knowledge of viability indicators will allow

utilization of the seed to its best advantage. Specially trained technicians as those found at the Oregon State University Seed Laboratory stand ready to advise or explain the tests in more detail so that an educated decision can be made concerning the seed in question.