

Some Field Conditions Which Influence Germination Technique

BION TOLMAN¹

IT IS A WELL-ESTABLISHED fact that there are wide differences in the rate and total germination of some lots of sugar beet seed. It has been found that some lots of sugar beet seed contain substances in the corky seedball which are released during germination and have a toxic effect on the germinating seeds. The presence of these substances is reflected in delayed germination, darkening of sprouts, and lowered total germination percentage. It has been shown that these substances can be washed from the seedball as a part of the laboratory germination test, and that all interference with the laboratory test can thus be avoided. It has also been shown that these substances consist largely of nitrogenous compounds which during germination are broken down by enzymatic activity to free-ammonia (1) (2) (3).²

This paper is a report on some field conditions which influence the amount of these toxic substances in the seedball.

Effect of Fertilizer Practice

Sugar beets grown for seed respond greatly to nitrogen fertilization in most of the present seed-growing areas, and large amounts of nitrogen fertilizer are applied (4). Naturally the total amount applied, as well as the time of application, varies from one area to another and from one farm to another. That the fertilizer practice followed has an influence on the seed-germination procedure is apparent from the data presented in table 1. It is evident from the data that the late, heavy applications of nitrogen produced substances in the seedball which it was advantageous to remove by washing the seed prior to germination on blotters.

Effect of Soil Conditions

In the seed-growing area in southern Utah, as well as in some other areas, sugar beet seed is sometimes grown on saline soils. These saline soils are of course high in soluble salts and frequently contain an abundance of nitrates. In 1945, seed was obtained from three growers' fields in the vicinity of St. George, Utah, where the salt content of the soil was so high that not more than 10 to 25 percent of the plants survived. The germination of this seed was compared with seed from adjoining fields where the soil conditions were more normal. The results of these tests are given in table 2. It is evident from the data that soil conditions do markedly affect germination procedures.

Discussion and Summary

Both late nitrogen applications and saline soil conditions have been shown to affect the concentration of substances in the seedball which inter-

¹Agricultural Research Director, Utah-Idaho Sugar Company, Salt Lake City, Utah.

²The numbers in parentheses refer to literature cited.

ferre with laboratory tests of sugar beet seed. Since these substances are water soluble they can be removed by washing the seed as a part of the germination procedure.

It is recognized that only a small portion of the seed produced in any one area in any one year may contain sufficient amounts of these substances to create a problem in germination. However, since in the seed testing laboratory it is not possible to foretell when one of these problem seedlots will be encountered, it would seem best to adopt a germination procedure which will adequately handle these seedlots. It has been demonstrated that washing the seed in running water for 2 hours prior to placing it in the blotters will not only prevent injury on problem lots, but will also increase the rate of germination on all seedlots.

Table 1.—The effect of washing sugar beet seed prior to the germination tests as influenced by certain field conditions.

Conditions under which the seed was grown	Germination Percentage			
	Not Washed		Washed 2 hours*	
	4-day count	14-day count	4-day count	14-day count
Effect of fertilizer treatment:				
1. Unfertilized check plots	10	75	68	76
2. 600 pounds (NH ₄) ₂ SO ₄ May 15	8	65	70	75
3. 600 pounds (NH ₄) ₂ SO ₄ Oct. 15	20	76	73	77
4. 400 pounds triple-superphosphate	18	76	70	77

Table 2.—Effect of salt content of soil.

A. High salinity 10 to 20 percent plant survival:				
Field No. 1	8	67	86	93
Field No. 2	11	70	84	85
Field No. 3	15	79	81	85
B. Low salinity .3 to 5 beets per 100 feet of row:				
Field No. 1	23	75	74	78
Field No. 2	57	84	79	83
Field No. 3	31	74	68	73

*Seed washed in running water for 2 hours and air-dried for 24 hours.

Literature Cited

- (1) STOUT, MYRON, AND TOLMAN, BION.
1941. Factors affecting the germination of sugar-beet and other seeds, with special reference to the toxic effects of ammonia. *Jour. of Agric. Res.* Dec. 15.
- (2) STOUT, MYRON, AND TOLMAN, BION.
1941. Interference of ammonia, released from sugar beet seedballs, with laboratory germination tests. *Jour. American Soc. of Agronomy.* Vol. 33, Jan.
- (3) TOLMAN, BION.
1940. Toxic effect on germinating sugar-beet seed of water-soluble substances in the seedball. *Jour. of Agric. Research.* Dec. 1.
- (4) TOLMAN, BION.
1943. Sugar beet seed production in Southern Utah, with special reference to factors affecting yield and reproductive development. *U.S.D.A. Tech. Bul. No. 845.* June.