

Treatments per acre.	Percentage germination on	
	Dec. 30, 1938	Jan. 12, 1939
Super 3 cwt. ...	45	45
Super 3 cwt. + borax 15 lb. ...	32	40

Trials at Marton

The problems outlined above were investigated in a series of experiments at the Marton Experimental Area over the past three years. The methods of approach were as follows:—

(1) The search for other more slowly soluble compounds of boron than borax or the use of mixtures of borax and inert materials.

(2) The effect of increasing the rate of seeding.

(3) The resistance to germination injury and to mottle heart attack shown by different swede varieties.

(4) The method of placing the seed, manure, and borax in the soil.

(5) The effect of soil moisture and season.

(6) The effect of time of sowing the seed.

(7) The effect of applying borax at different times before and after sowing.

The results of a large number of trials, some hand-sown and some drilled, may be summarised as follows:—

(1) No compound of boron was discovered which was sufficiently available to the plant to control the disease while at the same time giving no injurious effects when sown with the seed of swedes and turnips. Compounds tried were "rasorite" (a more concentrated form of borax), calcium borate (borax is a sodium borate), recrystallised borax (in large crystals), various pellets of a clay (bentonite) and borax, and various mixtures of borax with fertilisers and various rates of application of these, but none of them was significantly different from commercial borax in effect on germination.

(2) **Rate of Seeding.**—Increasing the seeding rate per acre when drilling

with borax in contact with the seed gave a greater number of plants per acre. Although in some cases lighter seedings resulted in higher percentage germination figures, these increases were not sufficiently great to compensate for the lower number of seeds sown. Increasing the rate of seeding may, therefore, provide a means not of reducing germination injury, but of securing a sufficient number of residual plants in the field.

(3) **Variety of Swede.**—Vilmorin and Wilhelmsburger appear to be slightly more resistant to mottle heart attack than Superlative and Sensation, although for some reason Vilmorin was in one trial the most severely affected by germination injury.

(4) **Placement of Manure and Borax.**—Severity of germination injury is directly related to the amount of borax that comes in contact with the seed. The most successful treatments were broadcasting and application in bands 1 to 1½ in. to the side of the seed in the drill. In the absence of suitable implements it is therefore recommended that borax be applied broadcast.

(5) **Effect of Soil Moisture and Season.**—The greatest germination injury is found in a dry season, but, nevertheless, heavy rain shortly after the borax is applied appears to leach the material through the soil so that there may be little control of the disease. This was particularly marked in the trials in the 1939-40 season, when the infection of mottle heart was severe on all treatments. If very heavy rain falls shortly after applying borax it may be advisable to broadcast a second application.

(6) **Effect of Time of Sowing the Seed.**—This is directly related to the above factors of climate and soil moisture.

(7) **Effect of Applying Borax at Different Times.**—Application of borax during or shortly after sowing may be superior to application well before sowing, but the effect of rainfall in relation to time of application may have been the deciding factor. It has been demonstrated that application may be made as late as the rough-leaf stage of growth and yet give satisfactory results.

Amounts of Borax To Apply

The two graphs are taken from the results of a trial in the present season, and indicate that 40 lb. of borax per acre applied broadcast has given the best yields and also satisfactory

control of mottle heart. Although the measure of control of mottle heart was by no means complete even with application of 50 to 60 lb. of borax per acre, the results are of practical significance, for individual bulbs showed little severe infection with applications of 40 lb. of borax per acre and over.

Summary

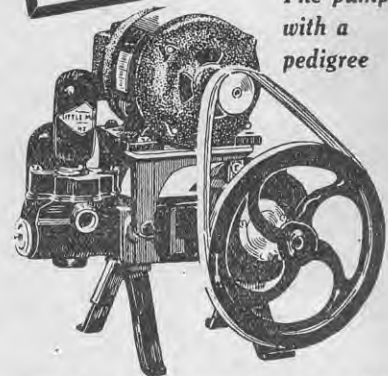
The following recommendations may be made with regard to the use of borax in the control of mottle heart of swedes and turnips.

(1) Broadcast 40 lb. of borax per acre shortly before or after sowing. If heavy rain follows the application, it is safest to repeat the topdressing.

(2) Use heavy rather than light rates of seeding.

(3) Wilhelmsburger and Vilmorin swede varieties may be used where the disease is known to be severe.

However, the problems as outlined earlier are by no means completely



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