"Getting Stands"

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With the introduction of segmented seed it became evident that uniform stands were difficult to obtain and it was the opinion of many that most of the trouble was due to the seed. We have learned through experience and study of our problems that securing satisfactory stands from processed seed depends as well on a number of other factors which were given little or no consideration when processed seed was first introduced. We have learned that land preparation, seed bed preparation, seed treatment, the size of seed in relation to size of planter cell, rate of seeding, depth of planting, type of planter and rate of travel, condition of seed plates, and operation of planter furrow opener and press wheels all have equally important parts along with seed in producing desired stands.

Land and Seed Bed Preparation

In the Red River valley in Minnesota and North Dakota, where an annual average rainfall of less than twenty inches is depended upon for moisture, land preparation the prior year is necessary in order to store additional moisture and preserve it for the beet crop. Therefore, all land leveling and deep tillage is completed in the fall in order that a good seed bed may be prepared in the spring by only a shallow cultivation and the liberal use of a harrow. This method holds moisture close to the surface for germination and leaves a coarse mulch which will reduce wind erosion.

Planter Cell Fill

The irregular shape and projecting corners of segmented seed prevented seed segments from entering the round seed cell in the seed plate of the planter, resulting in a low rate of cell fill and low seeding rate. Change in method of processing seed to decortication has resulted in seed more uniform in size and roundness, which enters the planter cell more readily. In recent tests conducted by our organization, cell fill was increased by 11 percent by using decorticated seed as compared to standard segmented seed. It was also ascertained that the tolerance once thought ample to accommodate the irregularity of seed was too limited, and instead of allowing 1/64-inch tolerance a 2/64-inch tolerance is now allowed between the size of seed and size of cell, which further increased the cell fill by about 10 percent. Worn seed plates are another item which should be given attention, as badly worn places wall reduce the cell fill 3 to 4 percent.

Seed Treatment

Damping-off disease is another cause of reduced stands. The fungicides available do not offer a one hundred percent prevention of this disease, **but** the Ceresan treatment which up to the present time has been used more extensively than any other fungicide in this area has under normal conditions resulted in increases of from 8 to 10 percent in stands from treated seed as compared with untreated seed plantings.

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Rate of Seeding

The theory advanced by some in the areas where beets are grown under irrigation, that a low rate of seeding will eliminate hand thinning, has not proved out in practice in the Red River valley. It is a well known fact that due to less favorable germinating conditions field germination of seed is always less than the laboratory germination. With this known loss of germination, a uniform stand is not attainable when using a low seeding rate. On 18-inch row widths an 8-pound per acre seeding rate (having 41,000 to 43,000 seed units per pound) will give approximately one seed every inch in the row. This distribution in the row has under normal or even adverse conditions permitted leaving narrow blocks of from one-inch to one and one-half inch size for the cross-cultivation work, and with a fairly severe use of the finger weeder still leaves from 15,000 to 20,000 beet-containing blocks per acre, which is ample from which to work out a good stand under the conditions existing in the Red River valley, where, as previously indicated, a limited amount of rainfall is had.

Planter Performance

A precision drill equipped with the correct size of cells, and with plates in good condition, and using the proper size of seed, distributes seed evenly in the row. We have found that the lower the drop from seed can to furrow, the less bunching obtained, together with better distribution. It has further been proved that seed cans should be kept close to two-thirds full in order to maintain uniform rate of seeding. Speed is another factor which governs cell fill and seeding rate. In several field tests it was found that increasing the planting speed from two and one-half miles per hour to three miles per hour reduced the seeding rate by more than 6 percent.

Depth of Planting

In recommending the depth seed should be planted, the weather conditions which may follow planting must be taken into consideration. Not knowing what the weather may be, we must prepare for both favorable and adverse germinating conditions. There is no question that, with ample moisture and cloudy weather, which will permit moisture to remain close to the surface, very shallow planting is preferable. In the event, however, of high temperatures and high winds, moisture will be dried out to an appreciable depth, and then light rains may start germination and the heavy evaporation will leave the young roots stranded in dry soil with resulting loss of stands. Too deep planting will find the young seedling dying either from disease or from having exhausted the food supply before reaching the surface, with a consequent reduction in stand. It has been found in our area that a one and one-half inch depth seeding will afford protection in both directions.

The furrow openers should be checked after each year of service. As the disc openers wear the diameter of the disc becomes less, and the depth of planting is reduced accordingly.

At this point the condition of the seed bed has to be re-examined, as press wheels will form a deep trench in loose seed beds and a heavy rain at this time will level off the surface and increase the depth of the seed

according to depth of the trench. Therefore, a firm seed bed is also essential from the standpoint of securing a uniform depth of planting.

Furrow Opener

The furrow former and shoe developed by the Beet Sugar Development Foundation was used this year on an experimental basis in the Red River valley with a definite increase in emergence *in* comparison to the conventional type of furrow opener. On twenty 100-inch lengths of row, stand counts made after the new furrow opener showed that an average of 103.45 seedlings per 100 inches of row were obtained. Following the conventional type furrow opener, on twenty stand counts 84.2 seedlings per 100 inches of row were obtained, or an increase in emergence of approximately 19 percent. Some trouble was experienced, however, in moist soil sticking to the furrow-forming wheel and to the shoe opener, and also clogging of the tube. With addition of a scraper and a change *in* shoe we believe this difficulty will be corrected.

The English press wheel introduced by the Foundation this past season has proved superior to the standard type of press wheel. Comparisons of twenty random counts on seedling emergence when the English press wheel was used averaged an even 100 seedlings per 100 inches of row, whereas an average of only 84.2 seedlings per 100 inches of row were obtained when the standard type of press wheel was used. For efficient operation of the English press wheel, the ground speed of planter travel should not exceed two and one-half miles per hour. Operating at higher rates of speed caused the floating weight to rotate with the cage. This objection will no doubt be corrected by further improvements.

In the Red River valley a problem is experienced in bringing late plantings to stand. This is due to high temperatures and occasional high winds which draw off the surface moisture to a depth lower than the planted seed. As a means of overcoming this condition, ridge covering has been resorted to with considerable success. On a majority of fields which have been ridge-covered we have found that soil moisture rises close enough to the surface for full germination of seed. On other fields where soil moisture has receded ridging did not bring it in contact with beet seed to benefit germination of seed, but weed growth was controlled and it was not necessary to replant these fields. Growers must be cautioned to check their fields very carefully each day and remove the covering as soon as possible after it has served its purpose, making certain that all of the covering is removed and no part of the ridge is allowed to remain.

While there are certain hazards such as a period of wet weather or a heavy downpour of rain in connection with the use of this method for improving germination and field emergence of seedling plants, the risk is justified because of providing a means of weed control and bringing moisture to the surface by capillary action for germination until additional moisture is received in the form of rain.

The suggestions and methods outlined in this paper, with the exception of the furrow-forming unit and the English press wheel, have proved out in practice on thousands of acres in the Red River valley, and their use has produced such favorable results that we feel stands are no longer a serious problem but are simply a matter of employing on a large scale correct methods and means which we now have at our disposal.