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TOBACCO SEEDLING PRODUCTION

By T. G. HANEY, Officer-in-Charge, Tobacco Branch.

Production of a high quality crop of tobacco begins in the seedbed, and it is therefore essential that the utmost care and attention be given to this stage of the crop. In general, it has been found that it is better to grow one's own seedlings, rather than rely on those from an outside source, thus ensuring that strong, healthy seedlings of the correct variety and strain are available at the time of transplanting.

The first factor to be considered is the selection of the site of the seedbed. It has been recommended that twice the area required be fenced off, preferably with rabbit netting, so that the area on which the seedlings are grown each year can be alternated. In this way, build-up of weeds and diseases is prevented, as the portion not being used can be cultivated and kept free of weeds and host plants for diseases and insects. A shelter belt of shrubs could also be planted around the area for wind protection. The soil type selected should be a deep, well-drained, sandy loam, which does not form a surface crust. If an ideal soil type cannot be found in a convenient position, leaf-mould soil from the bush can be carted and built up in the beds to a depth of at least six inches.

Efficient drainage of the soil tends to make it warmer, and in some cases, it has been found advantageous to build up the seedbeds to a foot above ground level. Experiments have shown that low temperatures while plants are in the seedbed is one of the causes of premature blossoming in a tobacco crop, and any treatment which tends to give a higher soil temperature will be advantageous to the ensuing crop.

Sunlight is essential for warming of the soil and rapid growth of seedlings, so the site selected should have preferably a northerly slope in order to gain the maximum amount of sunlight throughout the day, and prevent excessive shade cast from the framework, from covering the beds.

The final consideration in choosing the seed-bed site is proximity to water supply. Beds, especially during the germination period, require ample moisture, and a

plentiful supply of water is necessary. This water should be tested for quantity of salts in solution, and if too high, an alternative supply must be found.

The usual size of the plant bed is 18 feet long by 3 feet wide. In building up the beds for efficient drainage, six inches overlap should be allowed all round so the framework can be placed on top of the soil and there is no breaking away of the edges.

WEED AND DISEASE CONTROL

Several substances have recently been tested which give a certain amount of control of weeds and diseases in seedbeds and preliminary trials have been made in the district. One of these, C.B.P. 55, when injected into the soil controlled the growth

A set of built-up, well-drained, seed beds at the Tobacco Research Station, Manjimup.



of weeds such as sorrel and nightshade, but had little effect on germination of grass seeds. No diseases were apparent in these treated beds. Further tests will be made using the emulsified concentrate which can be applied as a drench to the soil. Since there appears to be a build up of nematodes in the district, it is advisable to treat beds with a nematicide, so that seedlings are free of this disorder when transplanted. Further details of the application of these substances will be given after another series of experiments have been conducted.

FERTILISING

Recent trials have indicated that the application of up to 4 lb. per square yard of tobacco fertiliser to the plant bed give an increased number of healthier seedlings at an earlier date than when the previously recommended rate of 1 lb. per square yard was used. The applied fertiliser should be well mixed with the surface four inches of soil and the bed should then be levelled off, so that when watering is carried out, it does not tend to wash the top surface or lay in pools. After levelling, it is best to tamp the surface to create a firm foundation for the seeds.

FRAME CONSTRUCTION

After fertilising and levelling, the bed is now ready to have the framework put into position. Frames should be 6 in. high in the front and 12 in. high at the back, fitted with calico or canvas roller tops. Previously, a hinged top was suggested but it has been found by experience that these do not give a satisfactory seal for benzol vapours. The initial cost of canvas is higher than calico, but it is longer lasting, and more water and gas proof. Whatever material is used, it should be treated with a mildew-proofing agent such as "Shirlan W.S." by soaking it in a solution of one pound of the substance to 10 gallons of water, and then hung out to dry. Precaution should be taken against shrinkage if the material is to be cut before treatment. The use of windowlite is not recommended during early stages of seedling growth, since it tends to dry out the surface soil excessively. However, when the plants are bigger, it may be used with advantage provided sufficient water is applied and enough time given for the plants to harden off before transplanting.

SOWING THE SEED

One ounce of tobacco seed contains approximately 300,000 seeds, and theoretically is enough to plant 50 acres. However, allowance has to be made for percentage germination and selection of seedlings, and it is recommended that for every plant required, ten seeds should be sown. Thus, one ounce of seed should be sufficient for planting five acres of crop. There are approximately 12 level teaspoonfuls of seed to the ounce, and the best rate of sowing is one teaspoonful for each 100 square feet of seed-bed area. Since the seed is so fine, it is generally mixed with fine sand or sifted ashes for even spreading. An alternative method is to stir the seed into a watering can with holes large enough in the rose to allow seed to go through, and then water the beds with the seed in suspension. The sowing of pre-germinated seed is not recommended, as there is a danger of damaging the emerging root when sowing is carried out.

One of the most common causes of poor germination in seed beds is insufficient watering. Once germination commences, the seed should not be allowed to dry out, even for a few hours. In order to keep the surface soil, in which the seed is contained, moist at all times, it is advisable to spread a mulch after the seed is sown. Generally, a thin covering of coarse sand is used, care being taken, however, that it is not too thick. Coarse sand is used to prevent wash when watering. Pine sawdust has been used successfully, but it has a tendency to blow to the edges of the bed during windy weather.

Time of sowing of the seed has an effect both on the time taken for germination and the period when the seedlings will be ready for transplanting. Seed sown towards the end of July generally takes from three to six weeks to germinate, and seedlings should be ready for transplanting by mid-October, depending on weather conditions. Once warmer weather sets in, however, seed germinates in a period of one to three weeks. For mid-November plantings seed should be sown at the end of August.

After the seed has been sown and a mulch provided, seedbeds are then covered in order to prevent washing by heavy rain and also to endeavour to warm up the soil. The use of windowlite covers is not recommended at this stage, since there is a ten-

dency for the surface soil to dry out when this material is used. It is advisable to roll the covers back for an hour or so each day, to prevent a build-up of excessive humidity within the frame, thus creating conditions favourable for the developing of diseases and the formation of green moss on the surface. In warm dry weather, the beds may have to be watered several times during the day in order to keep them moist. Too much stress cannot be laid on this aspect.

WATERING

After the plants have become established, the method of watering should be altered, so that beds, instead of receiving light waterings several times per day, receive heavier waterings at less frequent intervals. Apart from encouraging better root development, this tends to leach to lower levels any fertiliser or other salts which may have been brought to the surface during the frequent, light watering period. An excess of salts in the surface layers can cause injury to the developing seedlings. During this period, the plants should not be allowed to wilt.

From about two weeks before the time of transplanting the hardening off process should commence, to allow seedlings to develop a hardiness for conditions which ensue after they are set in the field. The number of waterings is gradually decreased from this time so that plants develop a certain degree of drought resistance. For a week before transplanting, the seedlings should be able to do without water without excessive wilting.

If the seedlings are retarded in development, they can be forced by covering the beds with windowlite during the warmer periods of the day, but this practice should not be carried out during the hardening-off process. Another method used to force seedlings, where there appears to be a fertiliser deficiency, is to water the beds weekly with a solution of nitrate of soda. Two ounces of this substance are mixed with four gallons of water and spread over the beds. It is advisable to water the beds after this treatment to wash off any excess on the leaves.

TRANSPLANTING

Seedlings are ready for transplanting when they reach a height of from four to six inches. Planting seedlings which are

too big causes them to be burnt on the stem and necessitates replanting. If it can be seen that some plants are becoming too large before the land is in a suitable condition, it is advisable to pull these, thus allowing other smaller plants to obtain a suitable size and condition.

Before pulling plants, the beds should be given a thorough soaking to allow some soil to adhere to the roots when they are taken from the bed. After the beds have been pulled, they should again be watered to settle in the remaining seedlings.

INSECT PESTS

The most common insect pests which cause damage to tobacco seedlings are slugs, cutworms, seed harvesting ants, red legged earth mite and clover beetles.

A solution of 0.02% D.D.T. sprayed on to and surrounding the beds is the most effective mode of control for general pests. It is wise to use this spray at weekly intervals, and care must be taken that the strength of the solution is not too strong, otherwise injury and distortion of the developing seedlings may occur. If seed harvesting ants appear in the beds, a sprinkling of 20% D.D.T. dust around the holes should prevent further damage.

Where seedbeds have been planted near pasture, it is possible that clover beetles may cause damage to the young seedlings. In this case, a bait consisting of 40lb. bran, 1lb. Paris green and 3lb. molasses, mixed with enough water to make a crumbling mash should be scattered in the evening around the outside of the wooden frames.

DISEASES

The two major seedbed diseases encountered are damping-off and blue mould.

Damping-off is a disease of seedlings caused by numerous fungi or moulds. The development of these moulds is favoured by excessively moist conditions, which is the reason why it is advisable to give the beds sufficient aeration and sunlight during the germination period.

Pre-emergence damping-off occurs after germination of the seed and before the small seedlings appear on the surface. Failure to germinate is sometimes the result of an attack of damping-off. For this reason, it is advisable to treat seed

with a fungicidal dust before it is sown. All seed purchased from the Department is treated with a fermate dust.

A further method of control for pre-emergence damping-off is to water the beds at weekly intervals with a solution containing copper, as soon as the beds are sown. There are several proprietary products on the market which give good control of the disease. "Chestnut Mixture" is generally used but this mixture has to be made up freshly each time before use. After germination, this weekly treatment should continue to control post-emergence damping-off.

The usual symptoms of post-emergence damping-off are the appearance of a water-soaked area at ground level, after which the plants fall over. Once the disease starts on one plant it spreads in everwidening circles until a mass of rotting plants results. As mentioned previously, watering with copper mixtures will give control.

Blue Mould.

This fungus disease can attack plants at any stage, but in this area, it generally makes its appearance about three weeks after germination. The first symptom of the disease is the appearance of yellow blotches on the upper surface of the leaves. If not checked, a mould-like violet fungus growth appears on the undersurface of leaves within several days. Spores, or seeds of the fungus, then rapidly spread to all parts of the seedbed area.

Benzol will give complete control of this disease when properly used. When the substance is placed in the beds and allowed to evaporate, the fumes produced kill mould spores and also any fungal mycelium within the leaf tissue. This coal-tar derivative is highly inflammable and should not be handled near an open flame.

The use of benzol commences approximately three weeks after germination of the seed. At this stage, however, it is used at half the normal concentration. With relatively low night temperatures experienced in this district, it is recommended that the ratio of 1:100 of evaporating surface to seedbed area be used. Flat tins, not more than one inch deep should be used, and for ease of handling, a tin of four inch diameter is recommended. To give an example, if the seedbed is

18ft. x 3ft., the total area is 7,776 square inches. A tin with a diameter of four inches has a surface area of $12\frac{1}{2}$ square inches. Therefore, to obtain the ratio of 1:100, the evaporating surface required is 77.76 square inches, and six tins of this size will give the approximate area required. These tins should be placed at regular intervals along the length of the seedbed. Care must be taken when filling these tins to ensure that no benzol splashes on to the seedlings, as it is fatal to seedlings. There are several types of fillers which can be readily made up. The tins are filled every evening and the calico covers are then pulled over the beds and arranged so that the beds are as airtight as possible to prevent escape of the benzol vapour. If higher than normal night temperatures occur, the number of tins may have to be reduced. It is desirable that only sufficient benzol is placed in the tins so that little remains by morning and it can be discarded. During evaporation, the more volatile fractions of the liquid vaporise first, and if the remaining liquid is continually poured back into the drum, the proportion of these fractions increases, and towards the end of the drum, the desired amount of evaporation does not take place.

Treatment of the beds should continue until plants are no longer required. If, for some reason, an outbreak of blue mould does occur, continuous day and night treatment should be carried out for at least four days.

SUMMARY

1. Select your seed-bed site at a place convenient to good water and to ensure maximum sunlight.
2. Allow ample drainage by building up the beds.
3. Fertilise sufficiently and correctly.
4. Sow seed at correct rate—seeding too heavily produces weak plants.
5. Water judiciously during germination and later stages.
6. Applying fungicide for control of damping-off.
7. Make use of the correct insecticides at recommended rates.
8. Ensure that beds are airtight for use of benzol for blue mould control.