

In Field and Garden

SOIL BACTERIA AND SOIL INOCULATION

It has been known for hundreds of years that legumes (clovers, or other crops belonging to the same botanical group), when plowed under greatly increased the fertility of the soil. Up to the last quarter of the past century it was considered that the vast stores of nitrogen in the air were not available as plant food, i.e., that it could only be used by plants after its transformation into nitrates. It was then proved after extensive study that legumes could use this atmospheric nitrogen only with the aid of certain kind of bacteria (named *Pseudomonas radicola*). These bacteria when present in the soil penetrate the fine rootlets of the young legume seedling, multiply there and form nodules or "little bunches" or "tumors" on the roots, where they become active in taking nitrogen from the supply in the air and storing it up in the plant. The legume plant, then, cannot use the atmospheric nitrogen unless its roots are infected with the nitrogen-accumulating bacteria, and obviously the roots cannot become infected unless the appropriate bacteria are present in the soil. On old soils, or where clovers or other legumes are successfully grown in crop rotation, these bacteria are usually present. In new soils, however, or when new legume crops, as alfalfa, are grown on old soil, the appropriate bacteria are apt not to be present, and in such cases some method of inoculation should be adopted to supply the bacteria. Either of two methods may be used, namely, soil inoculation, and seed inoculation. Soil inoculation consists in securing soil from an established field of the legume to be sown, and spreading it over the field to be seeded at the rate of two hundred to five hundred pounds per acre. This method is cumbersome and expensive and is apt to introduce into the soil, seeds of noxious weeds or bacteria of plant disease, hence it is not a desirable method.

Seed inoculation consists in applying to the seed before it is sown, artificially brown cultures of the bacteria originally secured from the nodules on the roots of the same species of plant which is to be sown. By this method the bacteria are carried into the soil with the seed, and in ample numbers to practically insure infection of the roots, with consequent increased growth of the crop. The Bacteriological Laboratory of the Ontario Agricultural College has prepared and distributed such cultures to Canadian farmers each season since 1905. During the autumn, blanks were sent to those farmers who received cultures the spring before, on which they reported the results of the seed inoculation as to whether it had been of benefit to the seeding. A summary of this work for each season thus far is given in the accompanying table, which shows that for seven seasons the average percentage of favorable results is 60.2 per cent:

Summary of Results in Seed Inoculation, 1905-1911

Year	Total Cultures Sent	Total Reports Received	Inoculation Beneficial	Inoculation Not Beneficial	Others	Per-cent Favorable
1905.....	246	134	91	40	3	67.9
1906.....	375	144	72	48	24	60.0
1907.....	372	187	67	57	63	54.0
1908.....	2113	699	397	237	65	62.5
1909.....	2017	494	211	161	122	56.7
1910.....	3375	771	344	179	248	65.77
1911.....	4941	1307	453	371	483	55.0

*In this column are included reports from farmers who sowed no uninoculated seed, or in which long-continued drouth, excessive moisture, or some other condition injured or destroyed the seeding.

The cultures for inoculating seed are grown in the Bacteriological Laboratory on a specially prepared "culture medium," and each one contains a sufficient number of bacteria to inoculate a bushel of seed.

For inoculating the seed, the culture is simply mixed with a little skim-milk, or whey, or whole milk, then mixed thoroughly with the seed, which is then allowed to dry a few minutes and sown in the usual way. For the small amount involved in time and money it would seem advisable to inoculate all legumes.

Cultures will be distributed from the Bacteriological Laboratory during the season of 1912 for inoculating seed of alfalfa, red clover, alsike clover and peas. Each kind of seed requires a different kind of culture. The cultures are for use on seed only, not on soil. For inoculating a field which has already been seeded, but on which the stand is unsatisfactory, the best method is to practice soil inoculation as described above. The cultures are good only for the season in which they are sent. There is only one size package, this being sufficient for sixty pounds of seed, though the entire culture may be used on less seed without harm. The cultures are sent by mail with complete directions for their use. As heretofore, there will be a nominal charge of twenty-five cents for each culture to cover the expense of preparation and postage.

Applications should state the kind and amount of seed to be inoculated and the approximate date of seeding. Applications should be sent early, and should be accompan-

ied with remittance to pay in full for the amount of culture desired. Address as follows: S. F. Edwards, Ontario Agricultural College, Guelph, Canada. It is important that the application should state plainly the kind and amount of seed to be treated, and the Name, Post Office Address, County and Province of the applicant.

SHED FEEDING OF SHEEP

As the flocks of sheep in the majority of cases on the Island must be corralled at night to safeguard them against cougars, the following notes on the feeding suited to sheep in confinement, taken from the London Telegraph, may be interesting:

Although sheep are specially suited for a free and outdoor existence, there are circumstances in which they may be housed with advantage. Where wool is of greater importance than mutton, flocks are often housed, as may be seen on the extensive sheep farms of the plains of Hungary. The fine-wooled merino sheep are there accommodated with roofed buildings, into which they are hastened by the shepherds on the approach of rain, in order to keep the fleeces dry. The sheep "cot" was used in this country in medieval times as is indicated in the name of the Cotswold Hills, which at that distant period were famous for a singularly fine-wooled race of sheep. The idea of shed-feeding is not therefore a novelty, and although not adopted in the case of ordinary flocks, it is commonly resorted to by exhibitors in preparing their animals for show.

How Best to Use Sheds

Before sheep are placed in sheds they ought to be shorn, either closely or to within an inch of the skin. This keeps them cool and clean, and prevents that sweating and that greasy appearance produced by confinement. Sheep always seem to breathe quicker when housed, and are certainly disposed to perspire, and these objectionable features are prevented by securing enough ventilation by means of frequent openings in the walls whether of brick or timber, as well as in the roof. The shed should be roomy, airy, and, if divided into compartments, the partitions need not be more than three to four feet high. The floor should be firm and dry, and the litter ought to be removed frequently, and kept fresh, so as to avoid fermentation and heat. Nor should the animals be crowded, but they should have sufficient room to be separate, and to choose their own lairs. The shed is well provided with racks, cribs, and troughs, and should give upon a root-house, with a cutter and room for fodder and artificial foods.

Another object of the shed-feeder is to secure the sheep against foot lameness, not necessarily specific foot-rot, but a soft and spongy growth, encouraged by damp litter and want of exposure to the natural wear which is constantly taking place in the open field. The toes grow long, and the animals being in many cases heavy, contract lameness, so that constant attention and dressing are necessary. A lame sheep is not fit to send to a show-yard.

Kinds of Sheep

The shed system is not well adapted for lambs as these young creatures invariably do best out of doors. Even when intended for exhibition, the field and open fold are preferable to any form of confinement, as is shown in the training of the best pens of lambs at the shows. These lambs have not been reared in sheds, and probably no successful exhibitor would think of exchanging outdoor conditions for confinement. The animals suitable for housing may be referred to as follows: Shearing rams or wethers intended for exhibition; also ewes kept back for a similar purpose; and weak late lambs, which are not strong enough to withstand the winter. Such lambs are sometimes puny, and in many cases have peeled to such a degree as to be almost without wool. They may be picked out and placed in a comfortable shed, and it will be well to run the shears over them, and give them a more uniform appearance. They will do better than in competition with strong lambs in the fold, and the remainder of the flock is improved in appearance by their withdrawal. They will also do better separated, and after a few weeks may be disposed of at the good prices which small carcasses always command.

It will be gathered from these remarks that shed-feeding of sheep must be regarded as exceptional, but at the same time useful in certain instances. The fact that sheep are largely maintained for the purpose of folding and manuring arable land for corn at once militates against extensive shed-feeding. It is one of the main recommendations of sheep that they are independent, hardy, and extremely useful as a means of consolidating light land. In these respects they are superior to cattle.

SIMPLE SEED TESTING

The health and strength of plants depend so very much on the germinating capacity of the seed that the latter should never be bought, strictly speaking, unless they have passed a germinating test. At times, however, and in using home-grown seeds, it is useful to test a sample for oneself, and it will be found rather an interesting occupation. Every agriculturist should know something about it, as it is neither a difficult nor a tedious business in the case of most common seeds.

Very simple apparatus is all that is required—blotting paper and inverted saucers do very well, or slates are fairly useful, though rather too close fitting. The somewhat elaborate apparatus sold for the purpose is quite unnecessary for ordinary work, and even the glasses with covers, though these are very clean and handy, and the progress of the seeds can be watched without touching them.

All that is really required is sufficient moisture and enough warmth to start the seeds. A porous substance kept damp will do this, and covering this over ensures the moisture being kept in fairly evenly. This is the chief point to attend to, and the regulation of the moisture requires a little practice. If too much water is used seeds often go mouldy, and this is fatal, because the seed is generally destroyed, especially in very hot weather. For this reason, covering the seed is very desirable, as it keeps away germs.

The best temperature is about 60 deg. F., but the heat of an ordinary room will do pretty well if it is rather over than under this figure. Wet sand is a useful medium for tough, woody seeds, such as mangold-wurzel and beetroot, or for, say, peas and beans, all of which require far more moisture than small seeds. Sand holds moisture better than paper does if it is sufficiently fine. Having started a test with a hundred or more seeds, two points should be borne in mind. One is to see that germination takes place within the time limit, which varies for different kinds of seed, and the other is to note the precocity which the seeds show. The latter shows the "germinating energy" of the sample, and it is important if a careful test is required.

A vigorous growth is, of course, always desirable, but if extra information is required as

seeds on all bare places and hills, thus beautifying our city and creating a favorable impression on our visitors in 1915. This flower is synonymous of California to easterners.

The entire tract stretching from Mission Street away to the bay shore and up along the foothills will be planted this spring, and next season a waving field of golden flowers will welcome the visitors.

This hint from San Francisco might well be adopted here in Victoria to render vacant lots, at present unsightly blots on the beauty of the city, wild gardens of glowing colors. In England it is done regularly on odd corners of large private grounds, all the spare seeds being sown indiscriminately and indeed the seedsmen make up special packets for this purpose. There is many another flower that lends itself for this, the Shirley and Iceland Poppy, Nemophila, Cornflower, and Love-in-a-mist.

In the cultivation of the lavender plant, climate is probably of more importance than soil. In England, a light loam on chalk and a sunny sheltered position with south or southwestern aspect are probably the most favorable conditions. The plant is liable to be injured by frost. The soil should be well drained, light and fairly rich, and a naturally sheltered position should be chosen. The soil should be allowed to lie fallow before planting, all the weeds collected and burnt, and a good tilth obtained by ploughing. Manure may be added at the same time. Cuttings should be taken from established plants in summer and planted 3 to 4 inches apart in prepared beds, where they can be watered in dry weather. The young plants can be planted out in the following May, and dibbled in 4 feet apart in rows 6 feet apart. An acre will require 2,000

soil with quicklime, to plant it with other crops for a few years.

There are certain flowers we can never have enough of in the garden, and of these the Pansy will repay a hundredfold the little trouble to grow a constant yearly succession. By sowing now in the greenhouse and keeping the boxes well up to the glass when up, advantage may be taken of the first warm spring days to get them out into the open at first for some hours every day and then into some shady corner as their summer quarters. By raising them from seed any especially rich pattern and color may be propagated. If put into rich soil in the autumn it is possible to have them in flower nearly the whole year round. The old plants have a trick of gradually enlarging the "eye" until it spoils the whole coloring, but a note may be made of those deteriorating in this way, and the plants consigned to the rubbish heap. This is a plant that even from the seed likes a rich compost.

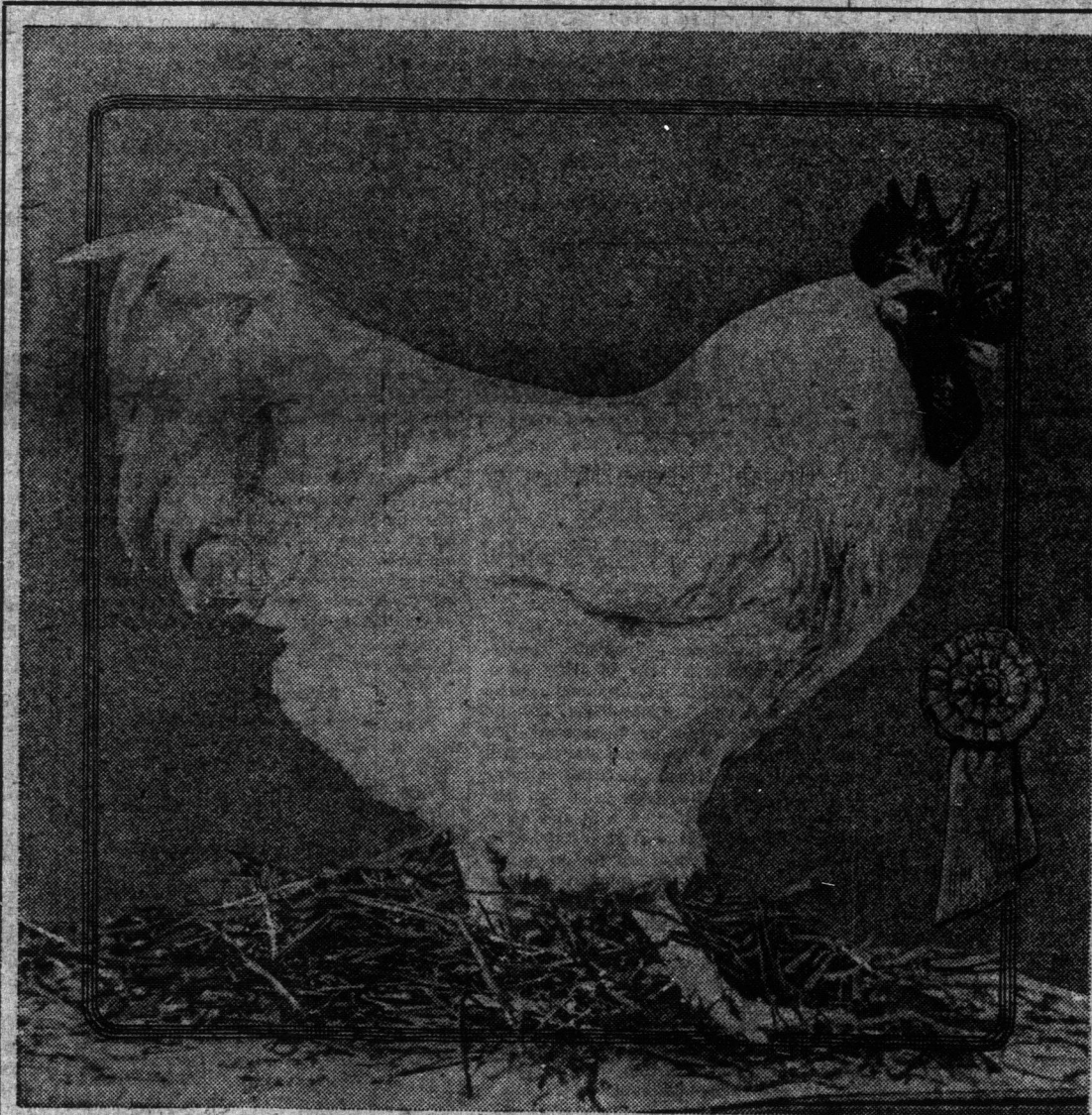
Remember to keep a shady corner for the violets to spend the summer months in.

These charming "Margaret" carnations have the admirable qualities of rapid development from seed to flower. It is quite easy to produce a grand crop of beautiful blooms in July from seed sown in gentle heat in the early spring, and to obtain excellent seedlings in about two months with careful treatment. The night temperature of his greenhouse should not exceed 45 degrees. The best compost for seed pans or boxes is three parts of loam to one of sweet flaky leaf mould, adding sharp sand to the mixture to the extent of one-third of the whole. An element in the successful raising of the plant from seed is very thin sowing. It is well to place the seeds 2 inches apart from each other in all directions. Another little point to notice is not to overfill the seed pan with compost. An inch of space should be left between the top of the soil and the top of the pan. It is worth while to take care of weak seedlings, which often produce beautiful flowers. With a good strain of seed the grower may expect to get 70 to 80 per cent of double blooms and charming shades of color.

Keeping Pigs

We hope that 1912 will among other things be distinguished agriculturally by the keeping of an increased number of pigs. The Americans keep them on a gigantic scale, and the small farmer also does well with them. A pig raiser in the United States who lives by these animals has given some practical hints to an interviewer. He says: "I would enumerate the essentials of success as careful intelligent breeding, proper care of the sow during the period of gestation and at farrowing, forcing both breeding stock and pigs to take exercise, abundance of grass, especially clover, and limited use of corn until the finishing period. The difference in weight between the litter of a young sow and a three year old at five months is approximately 20 lb. in favor of the older animal. I avoid inbreeding, and to be safe change boars each year. I keep a good mother so long as she is serviceable; I have frequently used them until well advanced in years. I house comfortably, furnish plenty of clean water, keep vermin away, and send them to market at the most profitable period. It is a mistake to think pig raising a road to money-making if you dislike the smell on your clothes. Nobody in that frame of mind ever succeeded. The primary qualification for success is liking for the pig. The pig is the most intelligent animal on the farm, and the one most responsive to good treatment. I have spent my life with them and know." Now as the American pig is mainly a maize-fed pig the English beginner will want to know if he too is to use maize. Denmark here supplies a hint as to why maize-fed pigs in Europe do not do so well as in America, where it is observed that the most successful raisers stop maize rations in the last stage of fattening. Both British and Continental raisers have inclined to give much less maize than the Americans, but to give it right up to the end. The Danish experimental farms now confirm the American method of a radical change in the last stage, and they supply us with some useful information of their own discovery. It is found that any bad effect of the maize is lessened if other concentrated foods are given at the same time. Thus a ration consisting of one-third palm cake and two-thirds maize produces results of a satisfactory character. Molasses in conjunction with maize can also be recommended as well as a feed composed of molasses, bran and palm cakes. The trials made in Denmark with several hundred animals have demonstrated the curious fact that the injurious effect of maize is greater in winter than in summer. Sunflower seed cake seems to exert the same kind of effect as maize, and with it the same circumstance has been noticed to the effect that its injurious influence on the fat is greatest in cold weather. The Russians however who are great pig raisers believe largely in sunflower cake. The problems of successful pig raising are not yet successfully solved by any means, but there has been decided recent advance in getting to the root of the matter.

A Belleville merchant has this sign on his store door: "Come in without knocking. Go out the same way."—Kansas City Journal



T. J. ADES, \$1,000, WHITE ORPINGTON, "SNOWDROP."

"Snowdrop," a White Orpington cock, owned by F. J. Ades, of Cedar Cottage, Vancouver, B.C., probably has more blue ribbons to its credit than any bird of any class or variety ever shown on the Pacific Coast. Snowdrop has been awarded firsts at the Poultry Association's shows at Vancouver in 1910 and 1911, also at the Vancouver Fall Fair the same years and at the Provincial Poultry Show this year. Last, but not least, "Snowdrop" took a first ribbon and a special for best white bird at the Coast Poultry Association's show, which was held in Seattle, February 6-11 this year.

Brothers and sisters of this bird have many blue ribbons to their credit, won at the Crystal Palace, London, and other English poultry shows. Young stock from these birds have never been beaten, says Mr. Ades, although the stock has been shown at five exhibits this year.

Mr. Ades declares that his wife, and not he, should have the credit for bringing his seven prize winning White Orpingtons, valued at \$2,000, up to their present high standard and strain. "Mrs. Ades has done most of the actual work and scientific mating of our stock," said Mr. Ades, "while I have taken the birds around for display purposes, and she deserves all the credit."

to the quality of the sample a note should be made of the number of seeds which germinate before the time limit has expired, and also of the size and vigor of the young shoot. A certain percentage will always germinate before the others, sometimes many days before, and this given an indication of the likely strength of the sample. About ten days is the proper limit for many of the commoner seeds, such as peas, beans, cabbage, clovers and cereals, a fortnight for beet, and three weeks for most grasses. Seeds of trees take the longest, from four to six weeks. Another point to remember is to admit air to the suds once or twice daily at least, as carbonic acid forms and must be got rid of.

FLOWERS FOR VACANT LOTS

A city park commissioner suggests the plan that the people of San Francisco plant poppy

plants. In the first year the plants should be cut back to prevent them flowering; in the third and fourth years they are in their prime and in the fifth year they should be dug up and burnt. Some other crop, such as potatoes should then be grown for a year or two before using the land again for lavender.

The harvesting usually begins early in August, and the yield of oil from the whole crop may be 12 lb. per acre; that from plants in their prime being from 15 to 30 lb. per acre.

The value of the oil varies according to quality, demand, etc.; at the present time the wholesale price for English lavender oil is about 40s. per lb. It is only advisable to grow the plant for oil if there is a distillery in the neighborhood. There is, however, a limited demand for the dried flowers.

The lavender plant is subject to a fungoid disease; it is therefore necessary to root up and burn old plants, and after sterilizing the