

Keep well cultivated and clean. A good coat of coarse manure applied in the fall, then worked in the next spring, will greatly increase the yield of fruit. Raspberries should not be planted near a fence, the snow drifting over them will break the canes down.

The pruning of the Black Cap should commence as soon as the young canes have reached the height of 18 to 24 inches by pinching off two or three inches of the end of young cane. This will cause them to throw out strong side branches, making a well-balanced bush that will need no stake to hold it up. The following spring the side branches should be shortened so as not to fall over onto the ground, cutting off all weak and frosted canes. Then as soon as fruit is all picked the old canes should be cut out as close to the ground as possible, and burned. This will throw the strength of the plant into the young canes, and the burning will destroy any insects and diseased plants that may be among them. All the pruning the red varieties will need is to take out the old canes and all weak plants in the fall. The fruiting canes may also be shortened a few inches in the spring.

VARIETIES.

Kansas is a black cap; good grower; plant healthy, hardy and productive. The berry is large, and of good quality. **Grigg**—also a black cap—is a strong grower, and a productive plant. It is healthy, but a little tender north of the peach belt; the berry is large and of good quality. **Hilborn** is one of the hardest of the black caps. I have known it to stand forty degrees below zero without injury. It is a strong grower; healthy and productive; berry medium size, quality very good. This is a safe one to plant in the north.

Marlboro is an early red variety; medium grower; hardy and productive. The fruit is bright red, firm, and of fair quality. **Cuthbert** is the queen of berries; plant a vigorous grower, healthy and hardy; fruit very large, deep rich crimson, firm, and of excellent quality; the best red raspberry for home or market. **Shaffer's Colossal** is also a good berry, purple in color, quality best for canning; plant a very strong grower, but a little tender in this section. **Columbian** is a new variety of the Shaffer type; it appears to be hardy, and a strong grower, and very productive; fruit very large, and of better quality than Shaffer; either for table use or for canning.

Some Recent Observations on Codling Moth.

It might have been supposed that after all the years during which we have been fighting the codling moth, its habits would long since have become so well known as to leave no part of its life history in the least obscure. But a recent bulletin by Prof. Fred W. Card, of the Nebraska Experiment Station, and one by Prof. M. V. Slingerland, of Cornell University, give many interesting facts which were not previously well understood, and, what is much more important, they give valuable suggestions as to how we may further cope with this enemy.

We have always been told, and it has been accepted without question, that the codling moth deposited its egg at the blossom end of the apple, and here the larva hatched and began its work. We are now told that such is not the case, but that the eggs are deposited almost exclusively on the young apples or on the upper surface of the leaves which are borne in close proximity to the blossoms. The old opinion was based on the fact that so large a percent. of the wormy apples are entered from the blossom end, but this is now explained as due to the fact that on hatching the little larva immediately seeks a hiding place, and the closed calyx cup is so well suited for this purpose as to be very often used. Prof. Card's observations show that about eighty per cent. of the worms enter at this point.

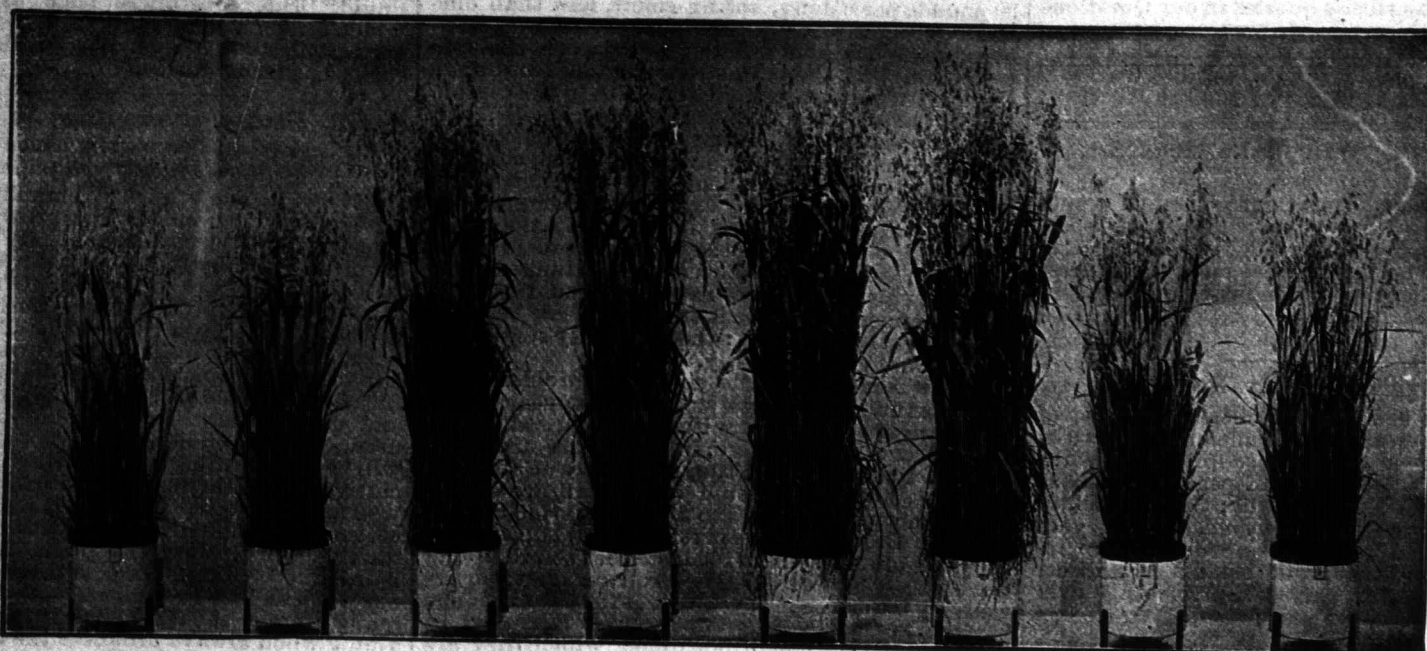
The moths begin to emerge in the spring much later than has been supposed, not before the latter part of May or fore part of June, and the eggs hatch in from six to ten days after being deposited. The little larva, in emerging, sometimes feeds on the leaf near the egg for a short time, but more often it immediately enters the apple. Here it feeds near the core of the fruit for from 10 to 15 days, in which time it becomes full-grown. It then usually leaves the fruit and hunts for a place in which to spin its cocoon, and the

place oftenest selected is beneath a rough piece of bark on the trunk of the tree, though it may go to fences, piles of rubbish, or under boards. The larva appear to leave the fallen apples and crawl up the trunk of the tree, or they may leave the apple while it is still attached to the tree and crawl downward. When there are two broods of moths, as in parts of Ontario, the second generation emerges about a month after the eggs from which they are hatched were laid.

Now, as to the remedies suggested. Since so large a percent. of the worms are found to enter the apple at the blossom end, it is plain that we should endeavor to protect the fruit from attack at this point, and this can be accomplished by the old method of spraying soon after the blossoms fall. It should be borne in mind that for perhaps a week after the petals fall the calyx cup remains open, and many of the apples are in an upright position, and this is the time to spray for the 80% of worms which enter at this point. If the poison can be lodged in this cup, and if there is not so much rain as to wash it out before the calyx lobes close over it, then it should remain there in readiness for the little worm when he gnaws his way into this cavity some two weeks later. And chemical analyses at Cornell indicate that this is usually what takes place.

The next question is how to combat the 20% of worms which enter elsewhere. Prof. Card most truly remarks that "this percentage is amply sufficient to people our orchards and riddle our fruit before winter. Another difficulty often appears by the proximity of a neighboring orchard which receives no care and from which moths may drift across to reinforce the enemy upon our own grounds." Later sprayings with Paris green have proved beneficial to some extent, but, strange to say, the leaves seem much more susceptible to injury at this time than earlier. From laboratory experiments by Prof. Card, spraying later with kerosene emulsion seems a promising remedy. He says: "This is the most encouraging line of warfare tried. It will be noted that all apples sprayed with kerosene emulsion before the eggs hatched were absolutely protected." He further recommends that paper bands be placed around the trees

Manuring Oats on Clay Soil with Phosphoric Acid.



The above photo, and the one on the next page, are taken from an illustrated lecture on "Manuring," to illustrate how remarkably great the difference in action is of the Alberts' Thomas-Phosphate Powder, as compared with bone or other Thomas-Phosphates, by Prof. Paul Wagner, Ph. D., Director of the Agricultural Station at Darmstadt, Germany. This photo shows the growth of the plants tested with different forms of fertilizers containing phosphoric acid.

about the last of June, when the larvae are beginning to leave the apples to pupate. These bands should be examined two or three times a week, taken apart, and any insects found beneath them destroyed. Screens should be placed over the windows and doors of the room used for storing apples, to prevent the escape of any moths which may have been carried in with the apples in the fall.

These two bulletins show how greatly the habits of the codling moth vary in different parts of the country, and emphasize the necessity of careful observations as to its habits in any particular locality, if fruit-growers are to be most successful in their warfare against this pest. But, lacking definite observations in his own locality, a grower can perhaps adopt the methods suggested in one or the other of these bulletins, according as his climate resembles that of the station at which the bulletin was published.

Principles versus Specifics in Teaching Horticulture.

Do not instructors too often overload the student with a mass of details instead of first grounding him thoroughly upon the underlying principles? In horticulture the field is so extensive and presents so many varying features that it is impossible to present to the student within the ordinary limit allowed to the study more than the framework upon which the science rests.

Is it not better, therefore, to plant the principles thoroughly first, and having these clear in the student's mind, let him work out their application as fitting the case in point. These thoughts are brought to mind forcefully by the questions asked in an examination in pomology, recently held by Prof. Bailey, in the College of Agriculture of Cornell University. Prof. Bailey has the knack of bringing out the salient points of each discussion. The questions submitted below and answers given

by a student illustrate the character of the ground covered in this course. These remarks apply not only to the conduct of classes at the University, but to the working classes met with in the Farmers' Institutes:

1. Under what conditions may windbreaks be advisable?

Ans.—The utility of windbreaks will depend (1) upon site (exposure); (1a) topographical conformation of orchard; (2) the kind of orchard crop to be cultivated; (3) the direction and character of the prevailing winds.

Windbreaks may be used with advantage in windy, exposed situations. They may also be used with disadvantage in such situations. The position of the windbreak with reference to the area to be protected is important.

A windbreak should not be placed in such a position as will tend to interrupt air drainage to the extent of causing or encouraging abnormal heat at unseasonable times; e. g., an orchard on a southern slope, with prevailing south-west winds, would probably be better protected by a windbreak on the south and west sides than on north. As a general rule it is best to place them on the windy side, but not too close, 100 feet or even 200 feet being better than nearer.

The whole windbreak question is one of local adaptation. In certain positions they are undoubtedly positively injurious; e. g.: about pear orchards, as encouraging blight; about peach orchards, as encouraging early blooming. About the orchard where they do not encourage sunscald, blight, and do assist in holding the fruit, picking the fruit, and protecting the orchard generally, they are to be encouraged. If the orchard soil is protected from the strong force of sweeping winds, evaporation and drying out are greatly lessened. If the orchard is protected by windbreaks the loss from windfall apples is much decreased, and the number of trees broken down by the force of winds very much lessened. Fungi and insects may be encouraged under the protecting agency of windbreaks, but these may be kept in check by the use of the spray pump, which in turn may be operated more effectively in a calm atmosphere.

2. State principles involved in preventing light frosts? Conditions.—(1) Location as favoring movement of air; (1a) altitude as being more favorably situated; the denser the air the more rapidly

does it settle, i. e., drop to lower levels.

Application.—Prevention depends therefore upon (1) movement of air currents; (2) the arresting of the evaporation of earth heat. Location, as stated before, assists (first) in covering the surface of the ground with something which prevents the heat rising, assists the second. For this reason "smudge fires" have been used in some districts with beneficial results. The smudge is effective in proportion as its smoke and vapor are charged with moisture. Dry smoke has been proved to be useless in protecting wheat fields from early frosts in the Northwest Territories. Smudges, unless very extensively applied, would be of little service in preventing general frosts in a general atmospheric depression.

To sum up, (1) evaporation, a cooling process, is retarded by covering the surface of the ground with an atmosphere charged with vapor; (2) the settling of the colder and denser air is prevented by the movement of air currents.

Moral.—Do not plant tender fruits in "pockets" subject to early frosts, but rather choose situations favorable to movement of air currents.

3. Objects of tillage in fruit lands?

(1) Conservation of moisture.

a. To render the plant food available.

b. To give a vehicle (water) for the transfer of plant food.

c. To promote nitrification.

(2) To preserve a favorable physical soil condition.

a. To encourage a good root system.

b. To keep down weeds.

c. To check evaporation.

The above might be summarized under three heads as follows: We till (1) to encourage chemical activities of the soil; (2) to improve the physical