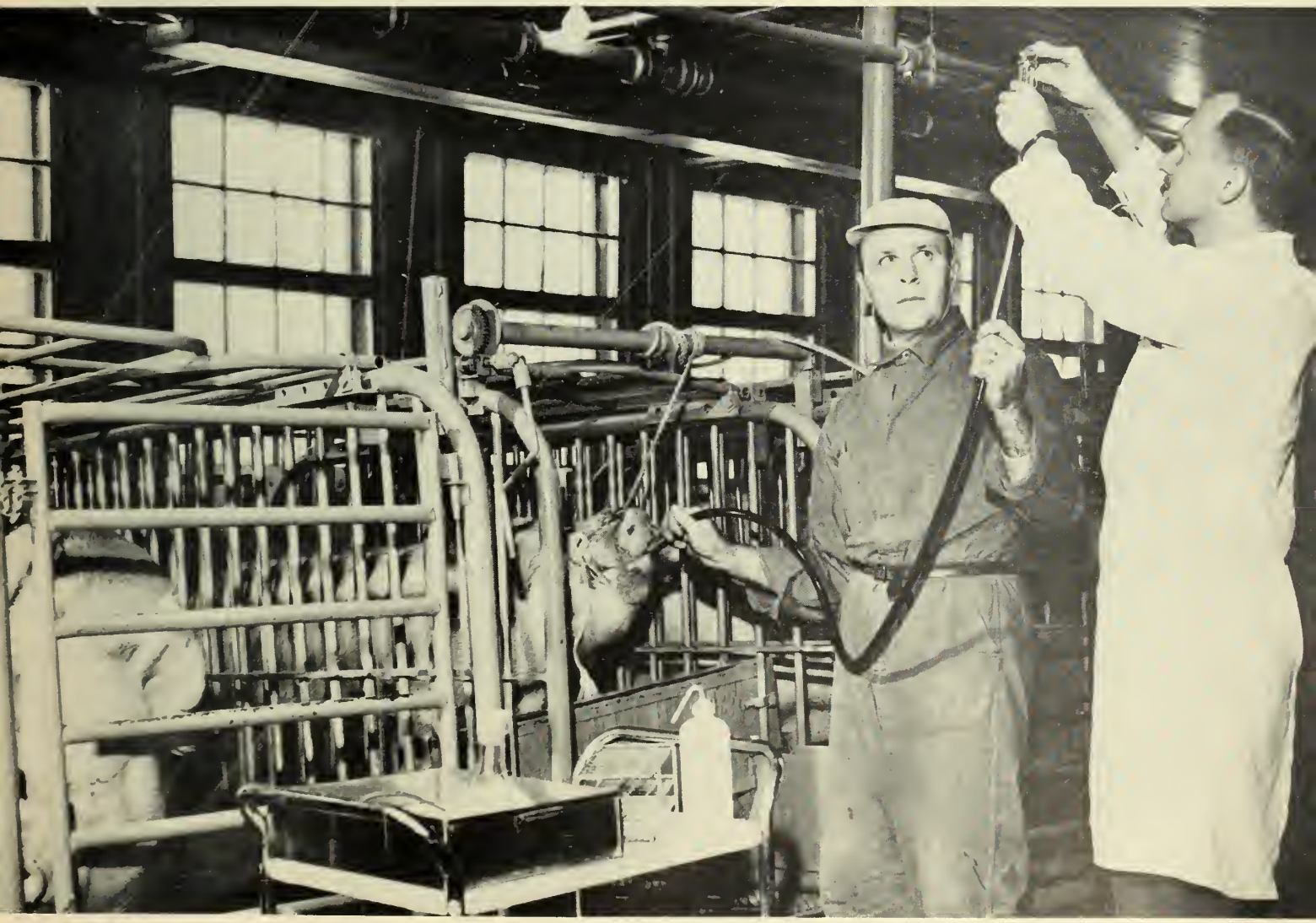
Research
FOR FARMERS

SUMMER—1962



CANADA DEPARTMENT OF AGRICULTURE

Research FOR FARMERS

CANADA DEPARTMENT OF AGRICULTURE
Ottawa, Ontario

HON. ALVIN HAMILTON, *Minister*
S. C. BARRY, *Deputy Minister*

Vol. 7 No. 3

"*Research for Farmers*" is published quarterly by the Canada Department of Agriculture. Its purpose is to help keep extension workers informed of developments in research and experimentation as carried on by the various units of the Department.

Contributions should be addressed to the Secretary, Editoriol Board, Informatian Division, Canada Department of Agriculture, Ottawa.

NOTES AND COMMENTS

"An Act Respecting Experimental Farm Stations" was passed by Parliament on May 12, 1886, and on June 2 received the Royal Assent. It authorized the establishment of five Experimental Farms and sites were selected at Nappan, N.S. (1887), Ottawa, Ont. (1886), Brandon, Man. (1887), Indian Head, Sask. (1887), and Agassiz, B.C. (1887). 75th Anniversary celebrations are being held at Nappan on July 10, Ottawa, July 13, Brandon, July 18, Agassiz, July 20, and Indian Head, July 25.

* * * *

Nine out of 12 steers died or had to be destroyed within a month—so report authors Bezeau and Bailey in their article, "Silica Urolithiasis in Cattle", which appears on page 3. How early in a calf's life do calculi form? These Lethbridge researchers have interesting experiments in progress.

* * * *

Acid peat soil investigations in Nova Scotia's Annapolis Valley, namely in the Caribou bog, show promise for horticultural crops, according to authors MacKay and Chipman in their article on page 4.

* * * *

Super sweet corn is new and limited in its availability. Seed is not yet available from the Morden breeding program—so reports Charles Walkof in his article on page 6. Little difficulty is anticipated in combining the super sweet and early maturity genes in desirable strains, he writes. But more time may be required to develop a satisfactory super sweet, early hybrid that is satisfactory for processing.

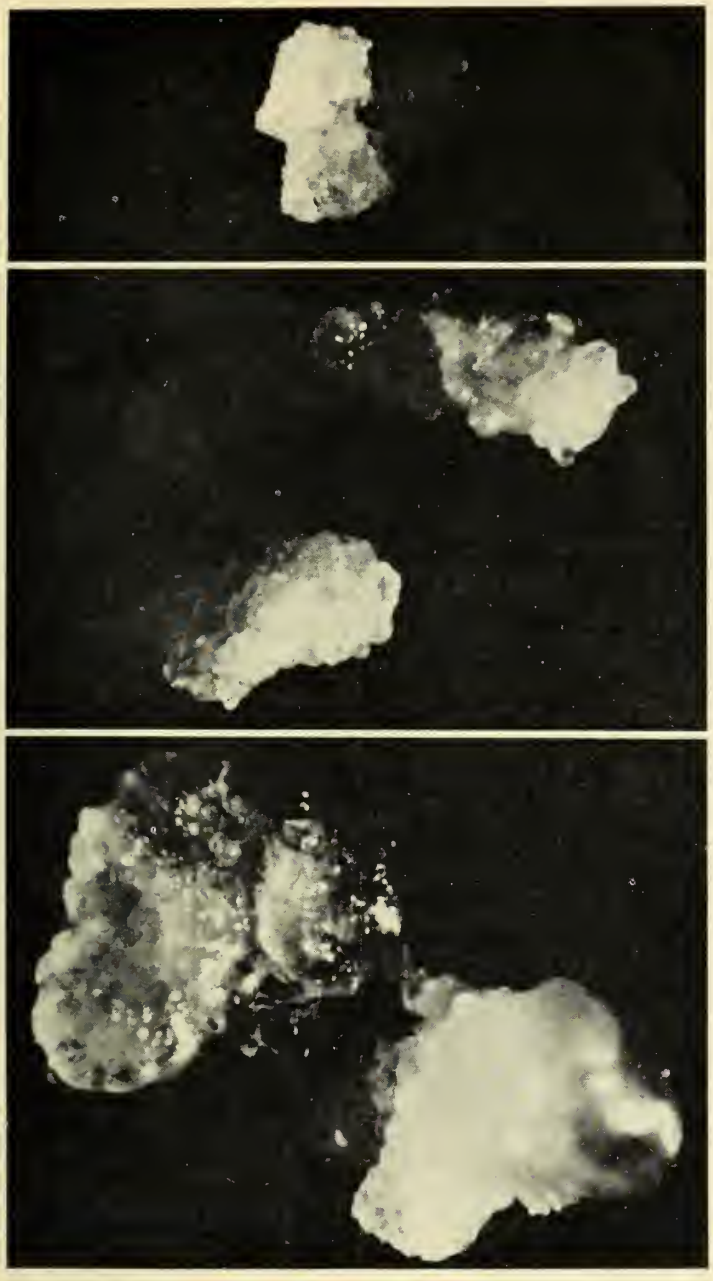
* * * *

How important is vitamin B_{12} to swine production? In his piglet mortality studies, G. L. Frederick reveals his findings to date. Note front cover photo and the story on page 12.

* * * *

Don't miss the 'shortie' by Bird and Smith on page 13. They've come up with some interesting observations on the relationship of blackbirds to crop production. Areas studied: south end of Lake Manitoba and vicinity of Altona, Man.

Cover Photo: **Radioactive vitamin B_{12} being administered to sow to study absorption in connection with piglet mortality.** **(See story p. 12.)**



Urinary calculi from newborn calves.

Kidney Stones a Killer

Silica Urolithiasis in Cattle

How early in a calf's life do calculi form? Lethbridge researchers have interesting experiments in progress.

L. M. Bezeau AND *C. B. Bailey*

NINE out of 12 steers died or had to be destroyed within a month! That is just one of many such cases reported by ranchers in southern Alberta. This particular rancher runs about 200 cows and usually sells the calves when they are weaned in the fall. When the calves were weaned in 1960 he decided to keep 12 to feed out. He kept them over the winter of 1960-61 and put them on range for the summer of 1961. That fall they came off grass in very good condition but the rancher decided to put a little more finish on them. Within a month he had lost nine with obstructive urolithiasis.

In Canada, the problem of silica urolithiasis seems to be peculiar to, and number one disease in, southern Alberta and southern Saskatchewan. Obstructive urolithiasis is also known as urinary calculi, kidney stones, bladder stones, and water belly. Although the terms are not synonymous, they are used interchangeably. The first clinical symptom observed is restlessness and occasional straining to urinate. Urine dribbles from the sheath, becoming bloody in the later stages. In winter, blood-colored icicles hang from the belly. When complete blockage occurs, the bladder ruptures within 24 hours, hence, the term "water belly".

Although the exact cause is unknown, methods of prevention have been suggested. One method is to feed extra salt but only if a plentiful supply of good drinking water is available—a stipulation that eliminates it as a preventive measure in most of the areas affected. Theoretically, the increased salt intake would have a twofold effect. First, the increase in water consumption caused by eating the extra salt would dilute the urine to such an extent that calculi-forming materials would be less likely to precipitate. In addition, if calculi do form they may be washed from the bladder while still small by the large quantity of water being passed.

(Concluded on p. 16)

The authors are with the CDA Research Station, Lethbridge, Alta., the former specializing in animal nutrition, the latter, animal physiology.

Peat soil requires lime before any crop can be grown. (1) potatoes limed, (2) potatoes unlimed, (3) lettuce growing on peat at various pH values.

Acid Peat Soils for Agriculture

Investigations in Nova Scotia's Annapolis Valley Show Promise for Horticultural Crops

D. C. MacKay AND *E. W. Chipman*

INTENSELY acid peat soils have generally been regarded as waste land, in the past. With adequate drainage and proper fertilization they represent a tremendous potential in Eastern Canada which is only beginning to be realized. The Kentville Research Station has been experimenting with these soils since 1952, and although problems still exist, yields of up to 600 bushels per acre of premium grade potatoes and over 20 tons per acre of table onions have recently been obtained.

Dr. MacKay is a soil fertility specialist with the Experimental Farm, Charlottetown, P.E.I., and Mr. Chipman is a vegetable specialist at the CDA Research Station, Kentville, N.S.

Our experiments have proceeded along several lines and have included field, greenhouse and laboratory studies. The field work has been restricted to the Caribou bog in the Annapolis Valley on an area which was prepared for commercial peat picking. The drainage ditches and the surface preparation used for that operation proved ideal for experimental crops.

Although these soils are highly infertile, their porous nature produces very high moisture holding capacity yet provides adequate aeration for an ideal physical medium for the growth of plants. Crops with high moisture requirements like lettuce and celery are well adapted to peat; crops requiring thinning on mineral soils, like onions and carrots, find it easy to grow and expand on peat without this costly attention; and crops like potatoes and carrots have a more attractive appearance when grown on peat.

Lime Requirements

The Caribou bog, like other sphagnum peats, is extremely acid (pH 3.5) and requires large quantities of lime for even acid tolerant crops like potatoes. Although optimum pH values have long been assigned to most crops, these values have not always corresponded to the ones found best in greenhouse studies with this soil. A pH of 4 gave tremendous improvement with practically all crops and was quite satisfac-

tory for spinach and onions. A pH value of 5 was optimum for potatoes, cabbage and carrots, while a value of 6 appeared to be necessary for celery and lettuce.

Major Nutrients

In our experiments with potatoes, we found that large quantities of nitrogen were necessary on these soils. The abnormally large number of tubers per hill was partly responsible for this. Other factors, as well, appeared to be involved, so that high rates of nitrogen were necessary for most crops. Phosphorus too, has been deficient, and although large yield increases were obtained from light applications, a ratio of nitrogen and phosphorus in the order of 1:1 has produced best results. Only slight response has been obtained with any crop from potash applications, although future experiments may show that higher rates will be necessary as pH changes are brought about and as residual potash is depleted.

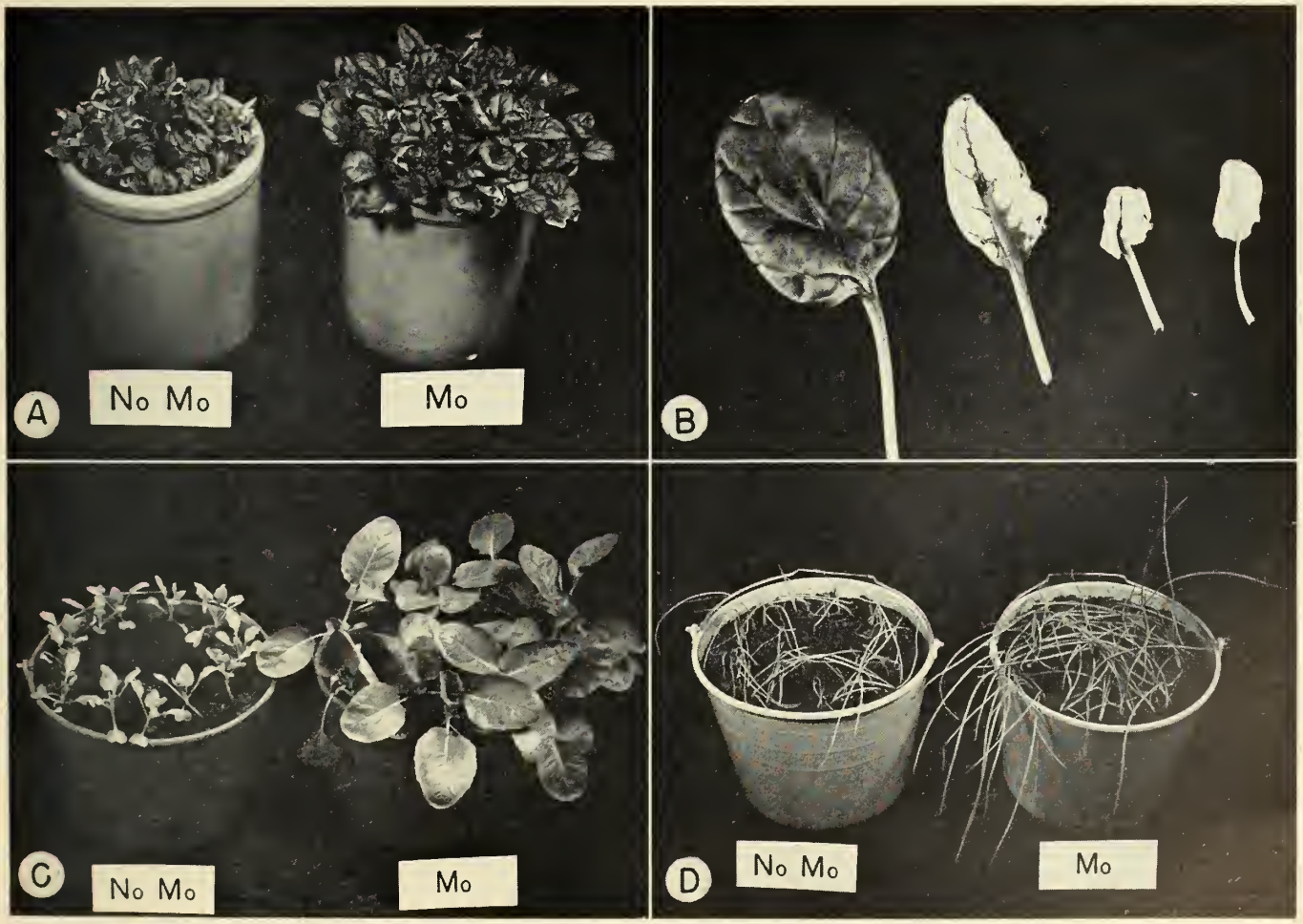
Trace Elements

The most serious trace element deficiency encountered so far is with boron. In the initial years of development, applications of 10 pounds per acre should be applied for any crop and heavier rates (30 to 40 pounds per acre) for such crops as celery and spinach. In succeeding years, the rates of application can be reduced, yet the Kentville results have indicated that there is much less danger of toxic accumulation in these soils than in normal mineral soils.

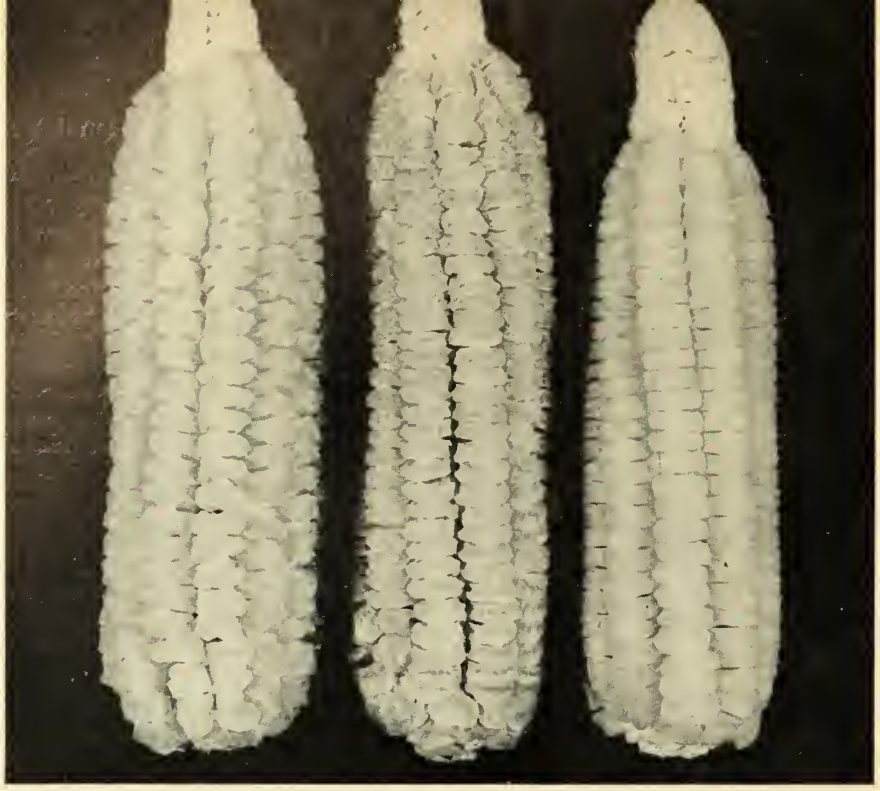
Molybdenum has also been found extremely deficient, particularly during the early years of development when unlimed acid pockets occur throughout the plant root zone. While specific requirements have not been determined for many crops as yet, seed treatment with a commercial molybdenum preparation coupled with a soil application of two to four pounds of ammonium or sodium molybdate have produced outstanding results with spinach, cauliflower and onions.

Although other trace elements have not produced beneficial effects in our experiments, some of these may become more important when the relatively small quantities contained in the peat are exhausted.

The commercial utilization of these areas presents many mechanical problems associated with drainage, tillage, planting and harvesting. Progress in their solution is already being made. In the future these unique agricultural soils will become of continually greater importance to Canada.



Molybdenum applications have produced outstanding results. A—spinach, B—normal and deficient leaves of spinach, C—cauliflower, D—onions.



Mature ears of sweet corn. Left to right: sugary dull, super sweet shrunken-2 and sugary standard type.

Super Sweet Corn

Early-maturing strains of super sweet corn being developed at Morden

Charles Walkof

SWEET CORN, two to three times as sweet as the sweetest varieties now in use, may soon be generally available as a result of team work by corn geneticists and chemists. This development in sweet corn improvement provides a pleasant product for the table whether it is used fresh or processed. It is of special significance to those who market sweet corn and to processors because succulent ears of super sweet corn remain in good usable condition for a longer period in the field and in storage than standard varieties.

The incorporation of super sweetness into early-maturing lines of sweet corn by breeding is an interesting phase of the corn improvement program at the Experimental Farm, Morden, Man. The objective of this work is twofold, namely, to develop varieties and hybrids for home garden use and others designed specifically for the fresh vegetable market and commercial processing in the Prairie Provinces.

Sugary Gene

Sweet corn hybrids and varieties in general use are sweet by virtue of a heritable factor known as a sugary gene. The effectiveness of this gene depends on modifying factors and therefore differences in sweetness and flavor occur between hybrid varieties. These differences are reflected in certain characters of ripe seed. For example, some hybrids and varieties have seed which is more shrunken or wrinkled and others have seed of varying opaqueness or starchiness. The sweetest corn is one with greatly shrunken and translucent ripe kernels.

"Super sweetness" in corn indicates that more sugar is present than that normally occurring in standard varieties. This is brought about by sugar-inducing genes not present in most sweet corn types. One of these, sugary-2, promotes an appreciably greater amount of sugar than the gene in varieties commonly used. Another is the starchy-sugar gene which is useful for developing strains of sweet corn for areas where extremes of temperature and moisture often depress plant growth. This gene was found originally in the Surecropper field corn variety which is grown extensively in the hot and arid southwestern United States. It has a promising potential for breeding sweet corn for short growing season districts in Canada.

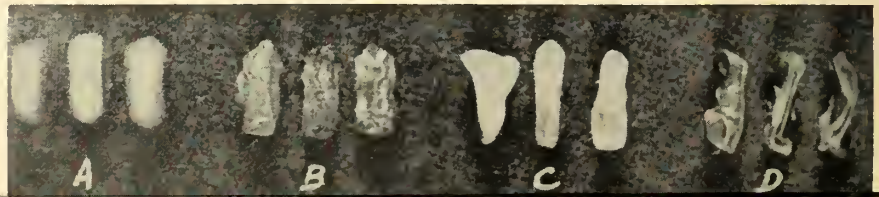
High sugar corn may also be developed by using genes which affect the corn kernel in other respects. One of these imparts a dull surface to corn seed and when the gene is combined by breeding with a sugary gene the sugars in the resulting strains are markedly enhanced. In fact, this combination of genes promotes the intensive development of polysaccharides, sugars that are important components in the production of aromatic flavors and a creamy consistency of the kernels. Another gene, which causes the corn kernel to shrink considerably, when used in combination with a sugary gene also enhances high sugar development. The resulting strain of corn is rich in sucrose and poor in polysaccharides. Such super sweet corn has been described by J. R. Laughnan of the University of Illinois as being "unusually sweet and with a pleasant malty flavor".

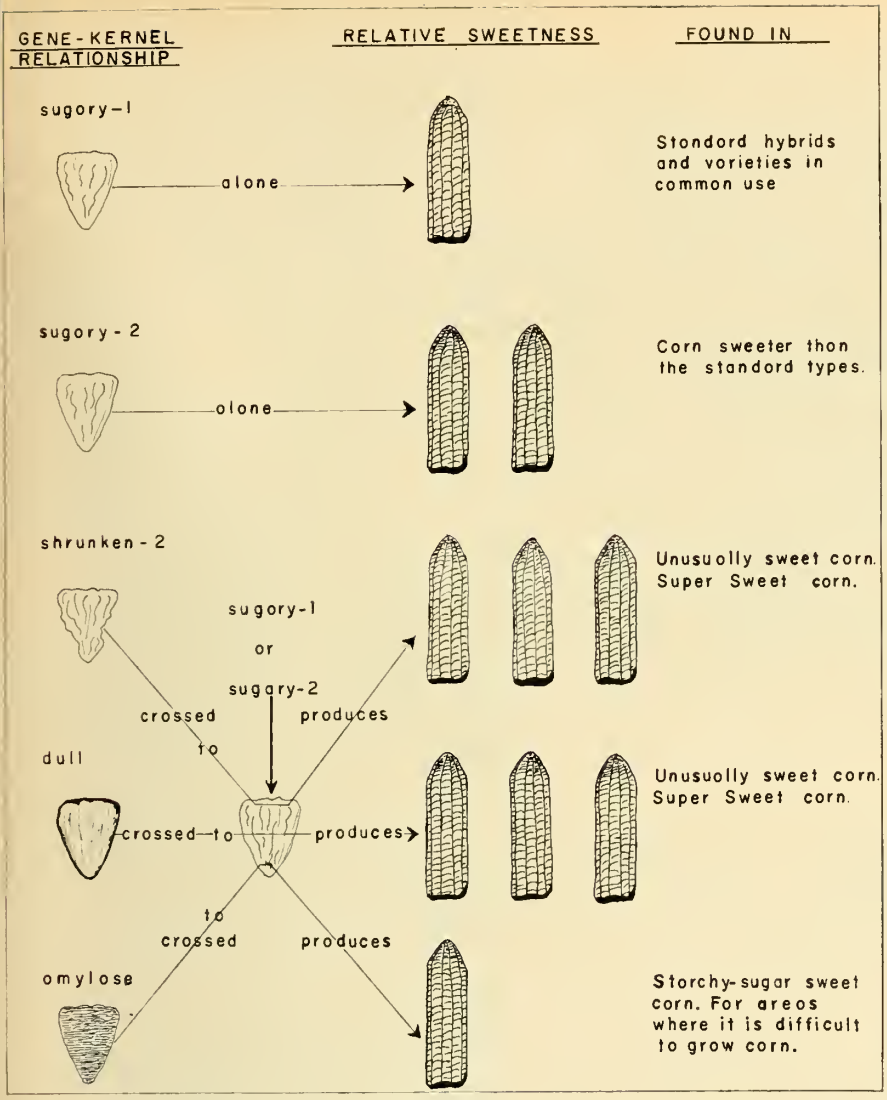
Sugar Development

Sugar development in the growing sweet corn plant is progressive and reaches a maximum during the second or third week after pollination. At that time it is strongly directed into the ear and with the approach of full kernel development starch synthesis begins. During warm weather this sugar to starch conversion process is markedly accelerated in standard hybrids and varieties. The quantity of starch developed varies

The author is Head of the Vegetable Crops Section, Experimental Farm, Morden, Man.

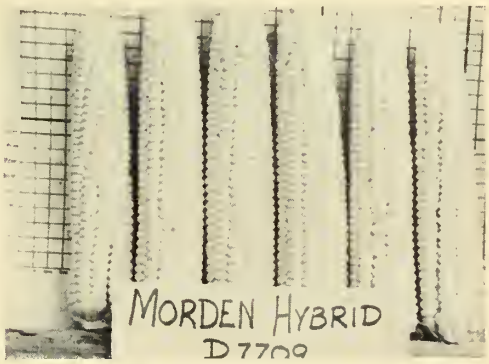
Mature corn kernel types: A. starchy field corn; B. sugary standard sweet corn; C. starchy shrunken; D. sugary-shrunken super corn.





Sweet corn gene-kernel relationships alone and in hybrid combination and their relative sweetness.

The dwarf, very early Morden F7735 which, in this illustration, was ready for inbreeding considerably sooner than the early strains of corn in the background.



An early, large-eared, Morden sweet corn hybrid with uniform and well-filled ears.

Author recording ear characteristics of tall-growing sweet corn hybrids.

markedly between strains and varieties. In super sweet corn, very little, if any starch is produced. The dull and shrunken kernel genes, while promoting sugar development, also block starch synthesis. It is this situation that prolongs the time during which the super sweet corn is suitable for harvest and also permits lengthy storage of corn ears in good condition. This is important for relieving pressure at harvest and assuring a reasonably long continuity of seasonal flow of prime corn to the canning industry.

Morden Breeding Program

A number of early-maturing strains of sweet corn at Morden have been crossed with super sweet corn in several gene combinations. Early maturity is easily transferred by breeding and fortunately it is not strongly associated in garden type sweet corn with too many undesirable plant characters. Relatively tall plant strains, up to 5½ feet, are practically as early as the dwarf 3½-foot strains. Genes for early maturity have also been transferred with minimum difficulty from flint corn to sweet corn. The earliness of the dwarf, Morden F7735 corn, which tassels in 35 days from seeding, was derived from Howe's Alberta White Flint. As a result, little difficulty is anticipated in combining the super sweet and early maturity genes in desirable strains. This optimism is restrained when the super sweet genes are to be combined in corn intended for processing purposes because certain plant characters important to the canning industry are not easily transferred by breeding. More time may be required to develop a satisfactory super sweet, early hybrid that is satisfactory for processing.

Super sweet corn is new and limited in its availability. Seed of it is not yet available from the Morden breeding program. Two late-maturing types, Illini Chief Super Sweet and Illinois hybrid R853 × F825 were distributed for limited commercial testing in 1961 by the University of Illinois.

Left: Moths of raspberry crown borer (female larger) mating on leaves. *Center:* Eggs on underside of leaf. *Right:* Early instar larvae mining cambium at base of new buds. *Insets:* Overwintering chamber (left) or hibernaculum on cane below soil level; one-year-old larva (right) overwintering in cane a few inches above the base.

Raspberry Crown Borer

Saanichton Studies Reveal Useful Data

J. Raine

FOR more than a century the raspberry crown borer has been a pest of cane fruits in Canada. It attacks raspberry, loganberry, blackberry and boysenberry and the native salmonberry and thimbleberry. In studying the life history and control of this insect at the Saanichton Experimental Farm we artificially infested a new loganberry planting with crown borer eggs every year for four years. We found that the young plants, which produce only a few canes at first, were especially susceptible to attack. We also found that yields were reduced 160 lb. per acre in the third year and 600 lb. in the fourth, or about $60.00 per acre for the third and fourth years.

Control

Good cultural methods and a sharp eye when the canes are being handled in the fall and early spring help to control this insect. Canes having galls at the base should be cut off as close to the crown as possible to expose the larvae in their tunnels where they can be destroyed.

To destroy the eggs, oil emulsions have been advocated but we found that these often injure the plants, require repeated application to cover the egg laying period, and do not always reach the eggs on trailing crops such as blackberries.

We found that residual sprays show some promise when applied in September to the bottom two feet of the plants to kill the young larvae as they crawl down the canes to overwinter. For example, emulsible concentrates of Guthion and Trithion were effective; endrin and Thiodan were partly effective; dieldrin and heptachlor were ineffective. Our studies indicate that these sprays must be applied when the first eggs hatch and several sprays may be needed to cover the hatching period. On trailing crops, the bases of the canes may be protected by leaves and difficult to reach.

Our investigations also showed that the systemic insecticides hold promise. Although we do not recommend them at present because information on residues in the harvested fruit is not available, we have conducted the following trials. We applied dimethoate at 1 pt. per 100 gal. to loganberry crowns, canes and foliage in April at 170 gal. per acre and found it reduced infestations from 75 to 16 per cent of the plants and it also controlled first generation leafhoppers. The cost for dimethoate is about $8.00 per acre. When we applied Systox as a drench we got more than a 20 per cent infestation. Phorate (Thimet) was effective but we consider it too hazardous to use on food crops. We also tried granular Di-Syston but found it ineffective when sprinkled around the base of plants at the rate of 1 lb. toxicant per acre.

The best method we have devised so far is to apply a drench to the crowns to kill larvae overwintering in hibernacula. However, more information on residues in the harvested fruit is required before the drenches can be recommended. The advantage of this method is that only one spray is

The author is a specialist in cane fruit insects now at the CDA Research Station, Vancouver, B.C.

Left: **Drenching loganberry crowns (upper) by hand; spraying same (lower) with single nozzle.** ***Above:*** **Moth of the raspberry crown borer emerging from base of canes.**

needed and it may be put on any time between late October to early April, at the time when canes are exposed and back in the rows where the tractor will not run over them.

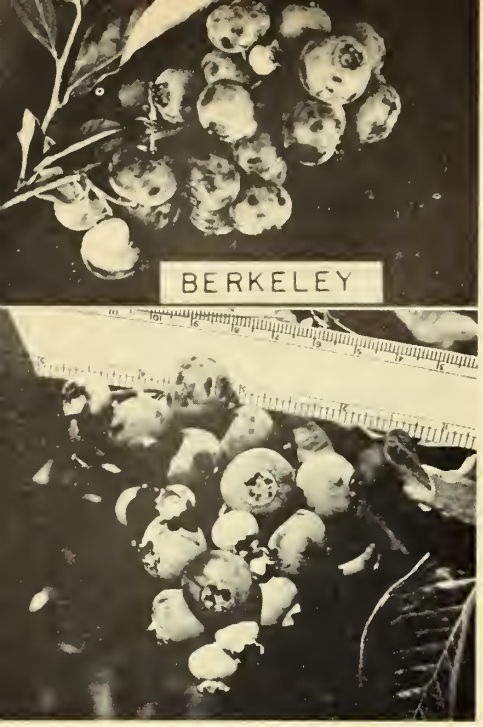
We found that emulsible concentrates of 25 per cent Diazinon at 2 pts., 25 per cent Phosdrin at 1 pt., 4 per cent lindane at 5 pts. and 12 per cent Sevin at 8 pts. in 100 gals. applied at 1 pt. of drench per crown, reduced infestations from 90 per cent of the plants to below 10 per cent. Furthermore, our tests revealed that Diazinon was outstanding and consistently gave good control down to ½ pt. of spray per crown.

At Saanichton we used a hand gun to spot treat loganberry plants. The cost of Diazinon required to treat one acre of loganberries, which are grown at roughly 700 plants per acre, is about $6.00. To drench raspberries, which are grown at more than 2000 plants per acre, required at least 400 gals. per acre applied to the crowns. This can be applied with a single nozzle at a cost of about $22.00 per acre.

Life Cycle

The adult moths resemble wasps. After studying the habits of the insect for three years we found that the moths usually appear in August, mate on the day they emerge and begin to lay their eggs the next day, singly on the undersides of the leaves near the margin. The eggs hatch in 4 to 8 weeks and the larvae, which are white with a brown head and about one-eighth of an inch long, crawl down to the base of the canes where they spend the winter in individual chambers or hibernacula on the canes just below the soil surface. By digging up plants every two or three weeks for two years we were able to follow the habits of the larvae as they tunnelled in the crown. In the spring they burrow directly from beneath the hibernacula into the cambium of the canes, damaging the new buds and shoots arising from the base. During the summer they feed at the base of the new canes, girdling them and causing gall-like swellings. These canes become spindly and usually break off.

The larvae overwinter a second time. They are now about one inch long and usually move a few inches up into the young canes or into the stubs of the fruiting canes of the past season to overwinter. During the second summer they tunnel in the fleshy part of the roots near the base of the fruiting canes as well as deeper in the crown. In July they tunnel upwards a few inches into the fruiting canes and pupate, leaving a paper-thin layer of bark at the end of the tunnel which is broken by the pupae when the adults emerge in August.



Berkeley—one of the new large fruited varieties.

A New Crop for Nova Scotia . . .

HIGHBUSH BLUEBERRY

D. L. Craig

THE highbush blueberry may well become an important fruit crop in Nova Scotia. This is a conclusion based on research conducted at the Kentville Research Station, designed to determine its adaptability. To meet this objective, we had to learn more about soil and growth requirements, winter hardiness, varietal suitability, susceptibility to disease and insect pests, and market acceptability.

Soils and Climate

In contrast to the production areas in the United States and British Columbia, the highbush blueberry does not grow well in Nova Scotia's peat soils. We cannot use bog areas because of the plants' inability to reach proper tissue maturity in the fall, frost heaving of plants during the winter, and spring frost injury to flowers.

Upland loamy soils that are naturally acid have been found to be ideal. Clay soils are unsuitable because of poor aeration, and sandy soils do not supply a constant moisture supply for the blueberry's very fine root system.

On some of our soils a surface mulch of sawdust or the incorporation of sawdust or peat into the soil has been very beneficial. This may be unnecessary where the loamy soil is deep and well drained.

Climate imposes a further restriction on the adaptability of the crop. The highbush blueberry will not grow well in areas having short growing seasons and low winter temperatures. Temperatures in the —20°F. to —30°F. will injure plant tissue and flower buds.

Cool springs delay growth and thus reduce yields. This is because the highbush blueberry fruit is produced from the growth made during the previous season. Optimum conditions for this growth are long photoperiods and reasonably high temperatures. Conversely, flower bud formation and proper tissue maturity depend on a gradual shortening of the photoperiod. Early fall frosts seriously interfere with this process.

In Nova Scotia these climatic restrictions limit the crop's adaptability to the southwestern portion. Here is where we find natural stands of highbush blueberries.

Nationally, these temperature limitations and requirements for acid soil conditions eliminate virtually all other areas of Canada except coastal British Columbia, where the highbush blueberry is already well established.

Varietal Suitability

High yields are essential if a crop is to be adopted commercially. Yields from our Research Station plots and from commercial plantings are comparable with yields from areas where the industry is well established. At Kent-

E. L. Eaton, native fruit specialist, examines Station's over-30-years-old highbush blueberry planting.

The author is a small fruits specialist with the CDA Research Station, Kentville, N.S.

Young commercial highbush blueberry planting at Rockland, N.S.

ville, single mature plants have produced in excess of 40 pints of fruit a year although the average is closer to 8 pints. In Michigan a planting in full bearing is expected to produce between 4,000 to 7,000 pints per acre. On the basis of our average yields an 800 plant per acre planting falls easily within this range.

Fruit size is an important consideration in marketing this new crop. The berries from the first varieties were not much larger than the native lowbush blueberry. This made it difficult to sell the fruit at a profitable return to the grower. Improvement in fruit size brought about by plant breeding has overcome this problem. Varieties which have been introduced during the past 10 years frequently produce berries an inch in diameter.

If a new fruit is to be accepted, fruit of high quality is of paramount importance. Many people are not fully aware of the excellent quality of the highbush blueberry. This lack of appreciation is frequently the result of experience with immature fruit. Quality tests show that the highbush blueberry is not mature on the day it becomes fully colored. The fruit must be left on the bushes to accumulate sugars. This involves little danger of fruit drop because the berry is quite tenacious. Left to mature, the highbush blueberry develops a flavor that is decidedly superior to the mild flavor of the lowbush blueberry.

Early maturing varieties are a prerequisite in Nova Scotia. The variation in date of maturity between different varieties is quite marked. At Kentville, the early maturing varieties are normally ready to harvest during the last week of July. Late varieties in the test plots may never mature all of their fruit.

Keeping quality is important. This is especially true for producers in Nova Scotia where the large markets are between 700 and 1,000 miles away and a variety must stand up to distant shipping. Careful attention should be given to the selection of varieties having dry scars (where the berry separates from the stem) and firm fruit. Such varieties will arrive on the market in much better condition than the wet scar and soft flesh types.

The sale of any fresh fruit depends on fruit appearance which in turn depends on color, size, uniformity and the ability to retain these characteristics after short periods of storage. At Kentville, we have discarded those varieties that are dark colored, lacking a light powdery bloom, and variable in size.

Insects and Diseases

To date, there has been no insect problem in plantings at the Research Station or those of commercial growers in Nova Scotia. Elsewhere there are a number of insects that attack the fruit. A similar situation will no doubt prevail as plantings in Nova Scotia increase in number and size. For the present, the only precaution that must be taken is to apply a soil insecticide to eliminate white grubs. This is normally done just prior to planting a new field.

The two most serious diseases are stem canker caused by *Fusicoccum putrefaciens* Shear and mummy berry caused by *Monilinia vaccinii—corymbosi* (Reade) Honey. Stem canker girdles the stem in one season, causing the stem to wilt and die. Removal of the stem by cutting well below the canker or complete removal of infected plants is the recommended control. Satisfactory control of mummy berry is obtained by preventing sporulation from mummy berries which are present on the ground in the spring. This is most easily done by cultivating, raking or hoeing to disturb the mummy berries and stop further development.

Occasionally a plant will become infected with either a "stunt" or a "mosaic" virus. Complete removal of the infected plants is the recommended practice. There are a number of other minor diseases, none of which is serious enough to limit production in Nova Scotia.

A 12-pint tray of highbush blueberries ready for shipment.

Piglet Mortality Studies . . .

How Important Is Vitamin B_{12} To Swine Production?

G. L. Frederick

WHEN you consider that approximately 1 in every 3 or 4 piglets dies before market age, that comparable losses occur within the sow before farrowing, and that weak pigs which do not die reduce efficiency and economy of production, the economic loss is tremendous. Relative to this problem, the Animal Research Institute has been studying the importance of vitamin B_{12} to swine production. In our investigations, we have confirmed and extended previous observations that vitamin B_{12} deficiency affects conception, gestation, piglet mortality, and piglet growth.

We have found that vitamin B_{12}-deficient sows may require more matings per successful conception, and that they may abort, if the deficiency is sufficiently severe. Successive pregnancies accentuate the deficiency. The offspring born of deficient sows often are physically weak and their mortality rate is high.

Our physiological studies indicate that the response of a sow's serum vitamin B_{12} level to an intramuscular injection of vitamin B_{12} can be used as a diagnostic test to determine vitamin B_{12} deficiency in individual animals. Sows with low ratios of preinjection to postinjection serum vitamin B_{12} levels have poor reproductive histories. As would be expected, all sows with poor histories do not have low ratios. Because the determination of serum vitamin B_{12} with a low assay error is a very difficult microbiological procedure, the ratio test will probably be used only as a research tool.

The possible benefits expected from vitamin B_{12} dietary supplements under specific circumstances will depend on the composition of the diet already in use. If the sow's diet is low in animal protein and it does not contain a vitamin B_{12} supplement, the benefits will be greater. The United States National Research Council currently recommends 5 μg (micrograms) of vitamen B_{12} per pound of sow diet. This is based on studies with *growing* swine. There are reports in the literature that indicate the requirement for growth is higher than the recommendation. Our studies indicate that the average requirement for *reproduction* also is greater. In some animals, it is much greater.

In our experiments, sows were fed a commercial-type diet in which only the vitamin B_{12} content varied, prior to and during the first 107 days of gestation. Diet I contained 1 to 2 micrograms (μg) of vitamin B_{12} per pound; diet II, 5 to 6 μg per pound; diet III, 50μg per pound. Conception was favorably influenced by diet III. The effect of the 3 diets on litter performance is shown in the table. Despite the fact that a diet high in vitamin B_{12} (15μg per pound of diet) was fed to the sows a week before farrowing and during lactation, and pairing together of 2 sows and their respective litters resulted in significant foster-nursing, diet III produced a significant reduction in the number of litters that had a high piglet mortality.

Our experiments and observations made on farms indicate that the vitamin B_{12} requirement of individual sows varies consider-

Dr. Frederick is a Research Officer with the Animal Research Institute, Ottawa, Ont.

MATERNAL DIET, LITTER SIZE AND PIGLET SURVIVAL

Observation	Maternal diet I Average	I S.E.[1]	I No. of litters	II Average	II S.E.[1]	II No. of litters	III Average	III S.E.[1]	III No. of litters
First farrowing season									
No. born/litter	9.7	0.42	35	10.0	0.40	38	10.5	0.43	33
No. live births/litter	9.0	0.39	35	9.5	0.38	38	9.4	0.41	33
No./litter alive at 21 days	7.5	0.48	27	8.2	0.46	29	8.5	0.46	29
%/litter surviving to 21 days	85.0	2.86	27	86.9	2.76	29	87.9	2.76	29
Range of percentages surviving to 21 days		40—100			44—100			62—100	
Second farrowing season									
No. born/litter	12.2	0.57	25	11.9	0.51	31	12.5	0.56	26
No. live births/litter	11.4	0.53	25	11.1	0.48	31	11.4	0.52	26
No./litter alive at 21 days	8.6	0.58	24	8.6	0.53	29	9.3	0.56	26
%/litter surviving to 21 days	77.3	5.43	24	77.0	3.68	29	81.9	2.55	26
Range of percentages surviving to 21 days		0—100			17—100			57—100	

[1]Standard error of average.

ably. Some sows, fed regular "balanced" diets without vitamin B_{12} supplements, can produce good litters; other sows require amounts even larger than currently recommended. Serum ratio and radioactive absorption studies support this conclusion. Some sows fed currently recommended levels of vitamin B_{12} have low serum ratios and reproduce poorly. Absorption of vitamin B_{12} apparently is limited according to requirement. Some non-pregnant animals achieve maximal absorption with oral doses of vitamin B_{12} as small as 10 or 25μg; others require at least 200 μg. In other studies that correlated the serum vitamin B_{12} response to prolonged feeding of different levels of vitamin B_{12}, we also found indications of a higher requirement than that currently recommended. Our current studies are designed to determine the effect of vitamin B_{12} nutritional status and pregnancy on vitamin B_{12} absorption.

The question of recommendations naturally arises. Our work, through its multiple interrelations, shows that the contemporary recommendation is inadequate for pregnant swine maintained under practical conditions at Ottawa. Many different experimental approaches in our laboratory have pointed in this direction. Confirmation by other workers using other animals and conditions is required. (An experiment is planned in Britain to test whether our findings pertain to British conditions.) One fact must be kept in mind. Expensive crystalline vitamin B_{12} was used throughout our work. Crude feed concentrates may not give the same answer. The apparent, wide, between-animal variation in requirement makes a specific recommendation difficult. Conventional, practical-type breeding tests to determine more closely the requirement for reproduction would have to be extremely large and costly. It might be wiser, and easier, to use a wide safety margin and feed diets that contain 25 or 50 μg of vitamin B_{12} per pound.

Vitamin B_{12} is not a panacea for piglet mortality and swine reproductive problems, but it is very important. It cannot be ignored.

Blackbirds and Crop Production

R. D. Bird AND *L. B. Smith*

LARGE flocks of blackbirds, mostly redwings, feed in grain fields adjacent to the south end of Lake Manitoba and in grain and sunflower fields in the vicinity of Altona. Crop damage has been observed and many complaints have arisen.

In our investigation to assess the relationship of blackbirds to crop production in these areas, some 500 blackbirds were collected at fortnightly intervals at three locations in each area from the time they arrived in May until they departed in October. The stomachs were preserved and later examined to determine the nature and the amount of their food. Their nesting, flocking and feeding habits were also observed. We found that redwings nest in water-filled roadside ditches and sloughs from which they range into adjacent fields to feed. The majority nest in agricultural areas.

In May and June, the food is mostly waste grain, sunflowers and weed seeds, chiefly green foxtail, wild buckwheat and wild oats. In late June, insects become an increasingly important part of their diet. In July the young are fed entirely on insects and the adults subsist almost entirely on insects. In August, when crops and weeds commence to ripen, vegetable matter again assumes the major part of their food. As soon as the young are on the wing, blackbirds gather in flocks which later join to form flocks of tens of thousands. At night they roost in tall marsh vegetation, low trees or willows close to or over water. From the roosts, they fly out in scattered flocks to feed. They must have water close to their feeding area and trees in which to rest. Hence fields adjacent to water and trees receive the most attention. The daily activity consists of short flights between the fields, the water and the trees. Oats, barley, wheat and sunflowers are eaten from the milk stage until they are fully ripe. This is the only period of damage and is of relatively short duration. Even at this period birds visiting fields in crop do not feed entirely on the crop. They consume many foxtail and buckwheat seeds and insects. Much time is also spent feeding on fallow land, pastures, sugarbeet and pea fields and as soon as the grain is cut they feed in the stubble where weed seeds and insects are in abundance. They consume large quantities of grasshoppers, beet webworm, pea and grain aphids and other injurious insects.

To the farming community as a whole the redwinged blackbird does much more good than harm. The individual farmer, however, may suffer severe losses.

Blackbird damage can be reduced to a minimum by (1) planting susceptible crops, sunflowers, oats, barley and to a lesser extent wheat, at a distance from blackbird roosts, water holes and trees; (2) leaving some stubble land uncultivated as feeding areas; and (3) persistent use of scaring devices. Haphazard attempts at scaring are a waste of time. Scaring should be started before the birds develop a feeding habit in a field and should not be relaxed to give them a chance to feed. Devices should be moved frequently so that the birds do not become accustomed to them. Exploders and firecrackers are effective particularly when used in conjunction with some shooting. The shotgun is not as effective and is more expensive than the .22 rifle.

The authors are with the CDA Research Station, Winnipeg, Man.

Scab on leaves (left) and early scab on fruit (right).

Dodine for Apple Scab Control

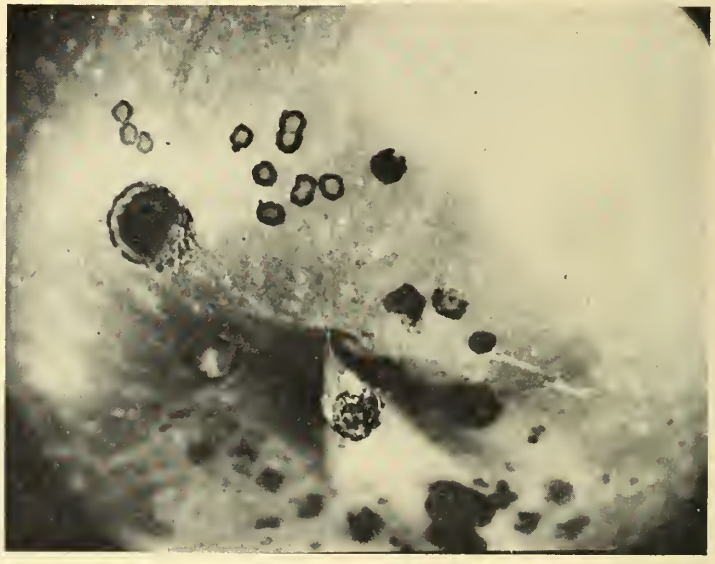
Interesting results obtained in Kentville tests.

R. G. Ross

In the apple growing areas of Eastern Canada, apple scab is the most serious pest of apples and the most costly to control. At the Research Station, Kentville, N.S., tests on fungicides for the control of apple scab have been carried out for many years. Before a new material is recommended for use by apple growers it must be field tested for several years to show that, in addition to being safe and effective, it has some special merit over fungicides already in use. Each time a new product is recommended for scab control it sets the standards higher for introducing the next one.

Dodine (Cyprex) is the most promising apple scab fungicide tested at Kentville in recent years. It has been consistently more effective than materials such as captan, glyodin, and dichlone for the control of early scab, late-season or pin-point scab, and storage scab. For example in 1959, a year that was ideal for testing fungicides, there was 4.7% early, 3.3% late and 71.8% storage scab on McIntosh apples sprayed with captan, whereas the dodine-sprayed apples had 0.7% early, 0.0% late, and 0.0% storage scab. Similar results have been obtained since 1957 when we first put dodine under test.

When a new fungicide is introduced the most effective and economical dosage for good scab control must be determined. This may be expressed in pounds per acre or pounds per 100 gallons of water. At Kentville we use the latter since it is the generally accepted practice of the apple growers in this area. Over the



Storage scab on fruit.

Dr. Ross is a specialist in tree fruit diseases at the CDA Research Station, Kentville, N.S.

years, dodine has been tested at rates of $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and 1 pound per 100 gallons. The $\frac{1}{4}$ pound rate has not given satisfactory scab control. A dosage of $\frac{1}{2}$ pound in the pre-cover and $\frac{1}{4}$ pound in the cover sprays is fairly effective but generally has not given as good control as starting with $\frac{3}{4}$ pound in the pre-cover and cutting down to $\frac{1}{2}$ pound in the cover sprays. We found no particular advantage in increasing the rate of dodine to 1 pound per 100 gallons.

Often a mixture of two fungicides is best. Our tests have included captan at 1 pound or glyodin at $\frac{3}{4}$ quart with dodine at $\frac{1}{4}$ pound per 100 gallons. Both mixtures gave excellent control of apple scab. They were more effective than dodine alone at $\frac{1}{2}$ pound or captan and glyodin at their normally recommended rates of 2 pounds and $1\frac{1}{2}$ quarts, respectively. The mixtures are considerably more economical than dodine at $\frac{3}{4}$ pound and are almost as effective.

Normally when apples are sprayed for scab in a protectant or pre-rain schedule, applications are repeated about every seven or eight days. Results with dodine suggested that it might be applied less often and still give control. For the last three years, it has been tested in a schedule in which the sprays were spaced about 12 days apart. This meant a saving of about two sprays in each year. Even in a 12-day schedule, dodine gave better control of apple scab than many of our regular fungicides applied every 7 or 8 days. A recommendation of a 12-day schedule is still somewhat premature but apparently dodine will allow more leeway in the timing of spray applications than most other fungicides.

What makes dodine so effective for apple scab control? Workers in New York State have studied the separate properties of dodine and conclude that its effectiveness is due to the sum total of its beneficial properties of good retention, redistribution, eradication, and local systemic activity. It is not as strong an eradicant or after-rain fungicide as organic mercury but it will kill out apple scab infections if applied within 36 hours of the start of an infection period. Dodine is the most effective eradicant fungicide that can be safely used in the cover sprays. Local systemic action is a term applied to a material that can move about within a leaf but is not necessarily transported from leaf to leaf. A young apple leaf sprayed with dodine seems to be protected against scab infection for the rest of its life.

Dodine is not without its faults. It has occasionally caused fruit injury. In most tests at Kentville the amount of injury has been negligible but in 1959, it severely injured 3 per cent of the apples in a McIntosh orchard. The exact conditions under which dodine causes injury are not known but it should not be used for a day or two following a frost. Dodine is incompatible with lime and should not be used in mixtures where lime is present. The dodine-captan combination has caused fruit russet in New York State but this has not occurred in Nova Scotia.

Sprayer in Kentville Station's orchard.

Silica Urolithiasis . . . from p. 3

The feeding of a protein supplement to range cattle may also act as a preventive. A survey conducted some years ago by the Experimental Farm, Manyberries, and the Research Station, Lethbridge, showed a significant negative correlation between the incidence of calculi in steer calves and the protein content of the feed.

Research has been handicapped by the fact that range steers almost invariably have urinary calculi present at the time they are introduced to an experimental ration. To ascertain how early in a calf's life calculi form, pregnant cows were fed native prairie hay which was predominantly rough fescue (*Festuca scabrella*). Calves from these cows were slaughtered at birth and found to possess uroliths. This fact indicates that the ration fed to the pregnant cow may play a very important part in the subsequent incidence of urolithiasis in the calf. Two methods have been used at this station to get around this problem. With the first method, metal discs are implanted in the bladder by surgery, and then the animal is placed on an experimental ration. Any calculous material that forms on the discs must have been derived from the ration fed after the implantation. Disadvantages of this method are (1) surgery is expensive, and (2) the material adhering to the discs may or may not represent the entire amount precipitated during the experimental period. The second method involves the use of dairy male calves. Such calves, it has been found, rarely, if ever, have calculi at birth, probably because of the better ration that pregnant dairy cows receive. This method has disadvantages, namely, male calves of the dairy breeds are in short supply in this area, and some dairy farmers are under contract to sell all their bull calves to feedlot operators.

In the experiment using implanted metal discs we divided the steers into two groups; one received alfalfa hay while the other group received native prairie hay. A summary of our data follows.

	Alfalfa hay	*Prairie hay*
Silica in the hay	0.6 per cent	5.6 per cent
Calcium in the hay	1.4 per cent	0.4 per cent
Urine pH	8.5	6.2
24 hours' urine volume	4.52 litres	1.69 litres
Silica in the urine	15 mg/100 ml	51 mg/100 ml
Silica in material on discs	4.0 per cent	34.0 per cent
Calcium in material on discs	20.0 per cent	6.0 per cent

Some of the above results have been noted in other experiments. We found that calcium was the predominant mineral in the alfalfa hay and also on the discs in that group, while silica was highest in the prairie hay and on the discs from that group. The amount of material deposited on the discs averaged about 140 mg. per animal and there were no differences between groups. The data from the prairie hay group and results under range conditions show that the hay, urine, and calculi always have a high concentration of silica. In addition, the animals drink a minimum quantity of water on this type of forage and the urine is always acid.

Because soluble silica, in a test tube, is precipitated in an acid medium and because the urine of animals fed native prairie hay is acid, it was thought that urine pH might play a part in the incidence of urolithiasis. In our investigations we used Holstein steer calves to study the effects of changing the protein:energy ratio of the ration, and the level of water intake on the incidence of urolithiasis. The ration fed was predominantly native prairie hay. The urine was made alkaline by the addition of potassium bicarbonate while the energy and protein ratio was controlled by the addition of vegetable oil and lactalbumin, respectively. The *ad lib* water intake was recorded during the sixth month of age, after which the animal was slaughtered and the urinary tracts examined. Our results indicate that:

(1) The pH of the urine *per se* does not influence the incidence of urinary calculi.
(2) The protein:energy ratio of a ration (within the range tested) does not seem to affect production of calculi.
(3) The weight of hay consumed may have an effect. The calves that did not have any calculi consumed 139 kilograms of hay during the six months of their life while those with calculi consumed 225 kilograms.
(4) The level of water intake may have an effect. The calves with no calculi consumed 7.9 litres of water per day during the sixth month while those with calculi consumed only 4.9 litres per day.

Further experiments are under way to evaluate the importance of restricted water intake, the level of prairie hay in the ration, and the percentage of protein in the ration on the incidence of urolithiasis in cattle.

Various types of urinary calculi found in older calves and mature cattle.