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More forage needed for our expanding livestock industry. Cover story and article page 3.

L'augmentation persistante du cheptel bovin crée un besoin parallèle en plantes fourragères. Légende pour couverture et article page 3.

CANADA AGRICULTURE

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La revue trimestrielle *CANADA AGRICULTURE* renseigne les vulgarisateurs et représentants du négoce agricole sur les développements de la recherche et des autres services agricoles du gouvernement fédéral.

Les articles en anglais ou en français doivent être adressés au secrétaire du Comité de rédaction, Division de l'information, ministère de l'Agriculture du Canada, Ottawa.

CRESTED WHEATGRASS AND RUSSIAN WILDRYE

S. SMOLIAK, A. JOHNSTON, and D. B. WILSON

Les plantules d'*Agropyron desertorum* poussent plus vite et se fixent plus facilement que celles d'*Elymus junceus*. Cependant, la plante en fin de croissance est plus feuillue et produit un gain de poids plus important chez le bétail dans le cas d'*Elymus junceus* que dans celui d'*Agropyron desertorum*.

COVER PHOTO *Crested wheatgrass and Russian wildrye are two perennial forages with potential. The current federal grassland incentive program offers a $10 per acre payment to farmers in the Canadian Wheat Board designated area who wish to increase their forage production. The objective is to increase perennial forage on the Prairies by four million acres because more forage will be needed for our expanding livestock industry. The forage program provides farmers with an opportunity to increase their perennial forage acreage. This increase must be matched with a corresponding decrease in cropland or summerfallow acreage.*

In the 1930's, crested wheatgrass was used extensively to reseed wind eroded areas and has continued to be used for regrassing in the drier areas of Western Canada. Crested wheatgrass provides nutritious pasture during the spring period and will remain productive for over 40 years if grazed properly. Easily established, it is one of the most successful of the introduced grasses. Russian wildrye, unique because of its high digestibility and long grazing season, came into general use more recently. Although Russian wildrye begins growth early in spring, it remains green and digestible much longer than crested wheatgrass. Russian wildrye is more difficult to establish than crested wheatgrass, which has reduced its acceptance by stockmen.

At the CDA Research Station, Lethbridge, Alta., we have compared the seedling growth of crested wheatgreass and Russian wildrye and related seedling growth of each to production from mature stands. Each grass has certain strengths and weaknesses, which are discussed below.

We grew single plants of crested wheatgrass and Russian wildrye in pots filled with perlite in the greenhouse. Water and nutrients were supplied to give the best possible growing conditions. For the next seven weeks, from the first emergence stage, we compared growth rates of the two species.

Each week, we harvested 20 plants of each grass and measured the total area of leaves, the total weight of tops, and the total weight of roots. We also recorded the rate of appearance of new leaves and tillers. We calculated three measures of growth: the leaf area ratio, the net assimilation rate, and the relative growth rate. The leaf area ratio, or the relation of the leaf area to total weight of the plant, compares the photosynthetic potential of the plant with the size of the plant that it must support. The net assimilation rate, which represents the net increase in dry weight per unit leaf area per unit of time, is an index to the photosynthetic efficiency of the leaf. The relative growth rate is a measure of the rate of increase in weight of the plant.

We found that the greatest difference between the two grasses was in the amount of dry matter produced (Table 1).

TABLE 1. WEEKLY DRY WEIGHTS OF 20 PLANTS OF CRESTED WHEATGRASS AND 20 PLANTS OF RUSSIAN WILDRYE

	Total dry weight (mg)	
Weeks	Crested wheatgrass	Russian wildrye
1	5	3
2	14	8
3	41	23
4	151	73
5	374	186
6	961	429
7	1,536	827

The authors are with the Plant Science Section, CDA Research Station, Lethbridge, Alta. Mr. Smoliak and Mr. Johnston are range management specialists and Dr. Wilson is a specialist in irrigated pastures and also Section Head.

During seven weeks of seedling growth, the crested wheatgrass produced more leaf and more root than Russian wildrye, or about twice as much dry weight. This apparently was due in part to a higher mean net assimilation rate, an indication that the species photosynthesizes more efficiently than Russian wildrye. Crested wheatgrass had a higher leaf area ratio than Russian wildrye during the first and second weeks of the test, and although this relationship was reversed during the third to seventh weeks, the early yield advantage gained by crested wheatgrass seemed to persist. In an earlier experiment, we had found that crested wheatgrass seedlings produced a greater total yield than Russian wildrye seedlings when both were grown for 90 days at root-zone temperatures of 45, 54, 67, and 80°F.

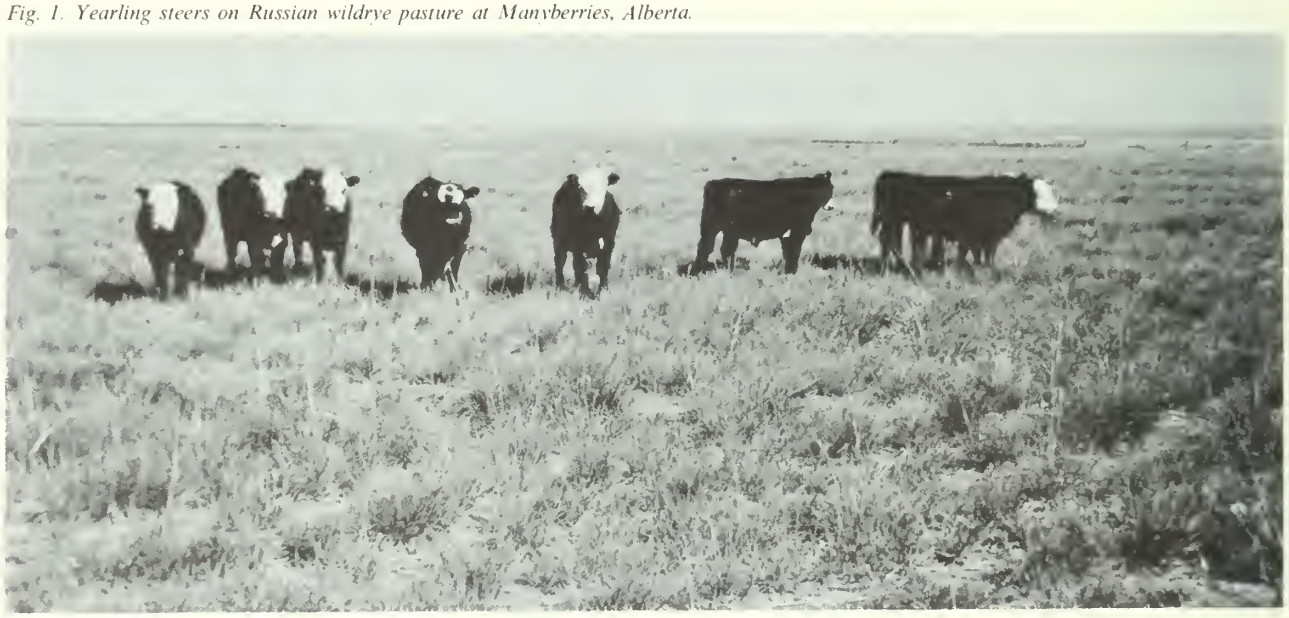
Why did crested wheatgrass seedlings produce more dry matter than Russian wildrye seedlings? First, crested wheatgrass seedlings produced more leaves than Russian wildrye as time progressed. On the average, a seedling of crested wheatgrass had 3 leaves at 2 weeks of age, 9 leaves at 4 weeks, and 36 leaves at 7 weeks. Russian wildrye had 3 leaves at 2 weeks, 6 leaves at 4 weeks, and 26 leaves at 7 weeks. Second, crested wheatgrass produced more tillers and more leaves per tiller than Russian wildrye. The first subsidiary tillers appeared on crested wheatgrass at 17 days, but not until 24 days on Russian wildrye. At 7 weeks, crested wheatgrass averaged 7 tillers per seedling and Russian wildrye averaged 6. The mean number of leaves per tiller was 4 for crested wheatgrass and 3 for Russian wildrye at 7 weeks of age. Third, crested wheatgrass produced about 3.3 times as much stem as Russian wildrye during the 7-week growing period.

The ability of crested wheatgrass to produce more plant material gives it an advantage over Russian wildrye during the establishment period. But as every stockman knows, when crested wheatgrass matures it produces an abundance of stems and seed heads. (That is why the grass is best suited to spring use.) Russian wildrye, in comparison, produces few stems or seed heads. In our study, stems and seed heads began to form in crested wheatgrass in the sixth and seventh weeks of the experiment. The tendency of crested wheatgrass to produce more stem than leaf continues until maturity. This has been shown in other studies with mature plants where stem-to-leaf ratios in crested wheatgrass were about 9:1 but in Russian wildrye were only about 0.3:1.

The higher yield of crested wheatgrass, and its early maturity, showed up during a 10-year grazing study at Manyberries, Alberta. Throughout the trial, crested wheatgrass pasture consistently outyielded Russian wildrye pasture (830 vs 645 pounds of dry matter per acre annually). And yet the average yield of animal products during these years was greater on Russian wildrye pasture than on crested wheatgrass pasture. (Yearling ewes gained 26 pounds per acre on Russian wildrye pasture as compared to 21 pounds per acre on crested wheatgrass pasture over a 7-month grazing season.)

The results of our study support the belief that crested wheatgrass seedlings grow faster than Russian wildrye seedlings. Under field conditions, crested wheatgrass is readily established in one season and then can be utilized by grazing animals. Russian wildrye requires about two seasons of protection from grazing before the plants become big enough to be utilized for grazing. ■

Fig. 1. Yearling steers on Russian wildrye pasture at Manyberries, Alberta.



Area received only 2 inches of water on July 3, 1968.

Area received 2 inches of water plus 400 lbs of NH_4NO_3 fertilizer per acre on July 3, 1968.

IRRIGATION OF SOLONETZ SOIL

R. R. CAIRNS

L'irrigation des Solonetz en Alberta a donné une augmentation remarquable des récoltes de foin.

An almost three-fold increase in the yield of hay crops has been obtained during the past three years at Coronation, Alberta, through the sprinkler irrigation and fertilization of Solonetz soil. In 1968 the application of two inches of water and 400 pounds of ammonium nitrate per acre increased the yield of hay to 3954 pounds from 1049 pounds of dry matter per acre on non-irrigated and non-fertilized areas. In 1969 there was over-irrigation due to an error and the yield of the fertilized and irrigated plots was restricted to 2960 pounds of dry matter per acre as compared with 1242 pounds per acre on the untreated plots. In 1970, irrigation plus fertilization increased the yield to 4634 pounds of dry matter per acre as compared with 1764 pounds on untreated plots.

Solonetzic soils have long been considered to be non-irrigable. Irrigation alone does not appreciably increase productivity on Solonetz soils and in some cases may depress growth. However, when irrigation and fertilizer practices developed at the Solonetzic Soil Substation at Vegreville, Alberta, are applied, excellent crop response can be obtained. These practices are based on: the general nitrogen deficiency of Solonetzic soils; the beneficial effect of ammonium nitrate on water penetration and the ameliorative effect of stimulated crop growth on Solonetz soils.

It is not suggested that Solonetz soils can be flood irrigated or even irrigated for the purpose of producing specialty crops. It is, however, possible to obtain a three-fold increase in the yield of forage crops grown on them. The increased and stabilized production caused by proper irrigation should be of great benefit to the livestock industry within the several million acre area of Solonetz soil in the Brown and Dark Brown soil zones of Alberta and Saskatchewan. Work to determine the most economic rates of application of both water and fertilizer and the long term effect of irrigation on the soil is continuing. Results to date show no tendency for the salts, that are characteristic of these soils, to move upward. However, this is a matter that will require constant vigilance.

Note: For background information describing the physical limitations of Solonetzic soils refer to *(Canada Agriculture*, Summer 1966, page 26-27). ■

Dr. R. R. Cairns is Officer-in-Charge, CDA Soils Research Sub-station, Vegreville, Alta.

FLAVOR AND McINTOSH

F. R. FORSYTH and C. A. EAVES

On cherche à connaître les quantités et proportions des substances volatiles composant la saveur des pommes McIntosh, afin de déterminer avec précision la durée de leur entreposage.

When you bite into a juicy apple do you ever wonder how the flavor or aroma got there in the first place? The flavor is due partly to a subtle mixture of volatile substances which the apple produces. The aroma also depends on volatiles which are influenced by the variety, the date of picking (48 hours can make a major difference) and length of storage. The fertilization of the fruit trees also affects the aroma. For example, heavy nitrogen application increases the total amount of volatiles and heavy phosphorus decreases the amount. The volatiles produced from whole apples have been measured by workers using gas chromotography.

The volatiles that help you enjoy eating an apple are important to us for other reasons. They help us make it possible to predict the storage life of apples. The practical aim of our experiment at the CDA Research Station, Kentville, was to assess the possibility that by determining one or more of the volatiles from the McIntosh apple we could predict its future storage life. The volatile ester ethyl-n-butyrate is known to be the most powerful of the characteristic odours of the McIntosh apple. Thus in our study considerable attention was directed to variations in levels of this substance during the storage life of the fruit.

The authors are plant physiologists at the CDA Research Station, Kentville, N.S.

Technician injects a sample into the gas chromatograph to identify the individual components of the aroma and indicate how much there is of it.

In the years 1968 and 1969 apples were picked at regular intervals (3 days in 1968 and 7 days in 1969) from a single McIntosh apple tree located in one of the orchards of the Kentville Research Station. The picking dates were chosen to encompass the period from the time that the fruit was immature to when it was overmature.

Included in the present study was a sensory evaluation of the aroma and taste of McIntosh apples of four of the different dates of pick. This was done by questioning 12 members of a taste panel as to their preference for taste and aroma.

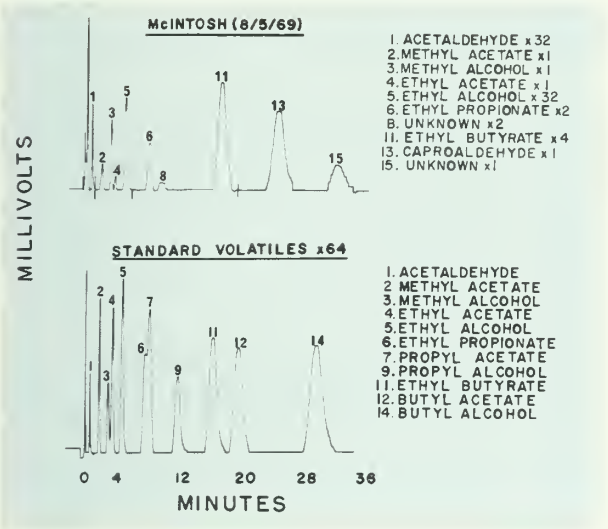
We found great differences in many of the characteristic aroma components of the McIntosh apple depending on how early it was picked and how long it had been stored. Strangely enough such aromatic substances as ethyl propionate, ethyl-n-butyrate and capro-aldehyde were produced in higher amounts from the immature fruit than the mature, especially towards the end of the storage season. Such substances as acetaldehyde and ethyl alcohol which herald the old age of the apple are present in extra amounts in late picked fruit. The overall picture then was of early picked fruit remaining strongly aromatic longer in the storage season than late picked fruit; the latter having passed through its better days much earlier in storage than did the less mature early picked fruit.

The tasters preferred the apples picked at our recommended dates of picking (Sept. 29 and Oct. 6) while rejecting the acid tasting very early pick (Sept. 22), and overmature late pick (Oct. 14). This would seem to be the usual order of preference encountered by taste panels testing fresh apples. The same tasters were asked to evaluate the amount of characteristic apple aroma coming from apples of various picking maturity using their own sense of smell. They were consistent in saying that there was more apple aroma from the McIntosh the later that it was picked. The first three dates of picking, Sept. 22, Sept. 29 and Oct. 6, showed increasing levels of aroma compounds which agrees with increased taste preferences as date of picking progressed. However, the final pick evaluated (Oct. 14) showed still greater aroma detectable by the tasters but they rejected those apples as being too soft in texture and lacking in typical McIntosh taste.

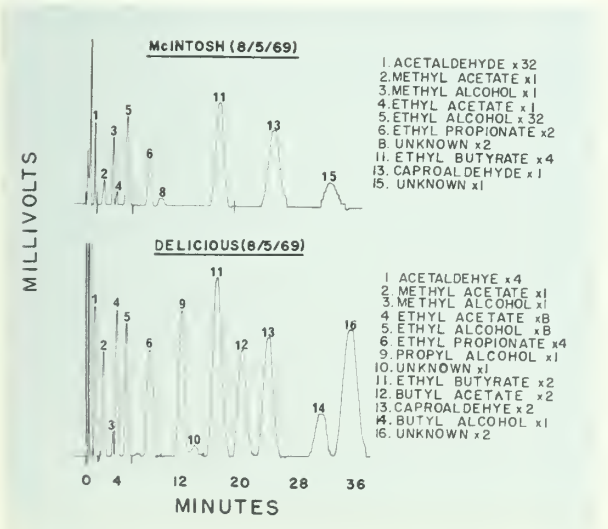
We can merely claim tentative identification for the chemicals mentioned as part of the aroma of

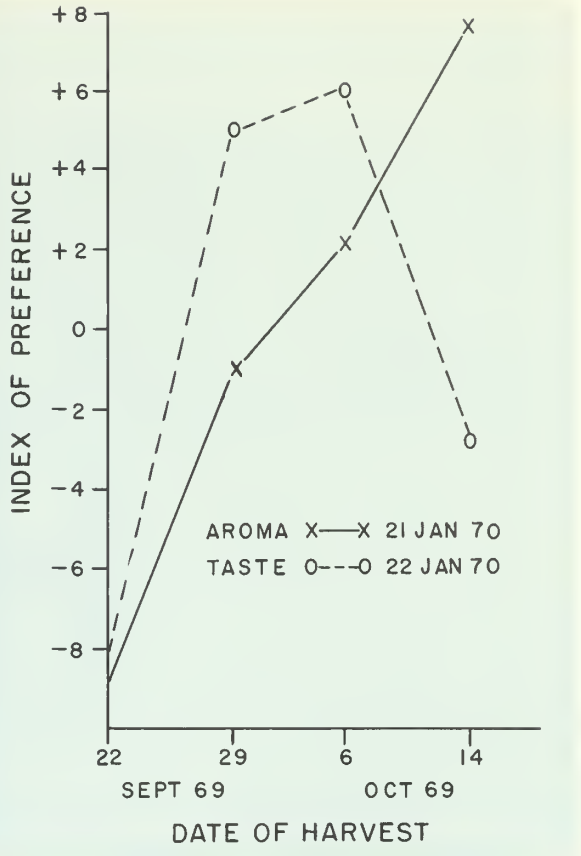
AROMA OF APPLES

McIntosh apples even though many of them, e.g. ethylene, acetaldehyde, methyl acetate, ethyl acetate and ethyl alcohol have been confirmed by the use of a different chromatograph column packing. The presence of ethyl-n-butyrate in the aroma of McIntosh apples has been claimed by two other re-



Top: The chromatograph reading shows the main aroma components of the head space gas over a sample of McIntosh apples. Lower: Shows locations of standards or known compounds purchased from chemical supply houses.





Taste preference and aroma rating by members of a taste panel who sampled the fruit and aroma January 22, 1970.

search workers so we feel that the identity is not in doubt.

The major components of the McIntosh aroma thus consist of two aldehydes (acetaldehyde and capro-aldehyde), one alcohol (ethyl alcohol) and three esters (ethyl acetate, propionate and butyrate). Obviously there are other compounds present in lesser amounts because if ten times as much volatile material is injected into the gas chromatograph, a few more weak peaks show up on the graph.

A great deal has been written lately about the probable role of ethylene (which we can consider to be a volatile but not aromatic as a ripening hormone for fruit. In both apples and bananas it has been shown that the ethylene levels begin to rise in the flesh of the fruit just before ripening commences. Our interest in ethylene from apples of various dates of pick was to find apples produce the greater amount of ethylene after long-term storage. We found that apples of any given pick reached a peak of ethylene production in February followed by reduced production as they grew older. The total ethylene production of early picked apples was less than that of later picked.

We would conclude that an "aromagram" of a sample of apples in which the results are expressed quantitatively could be useful when compared with the results of a maturity series such as used in our study. Then a good estimate of the storage quality and shelf life of the fruit could possibly be predicted. ■

PRODUCTIVITY AND INCOME IN CANADIAN AGRICULTURE

I. F. FURNISS

On calcule que la productivité agricole au Canada s'est accrue d'environ 2½% par année dans les années 60. Au cours de la même période le revenu total réel du cultivateur s'est élevé d'environ 1% par année. Il semble donc dans l'ensemble que l'augmentation de la productivité agricole a été à l'avantage autant des cultivateurs que des consommateurs.

Changes in agricultural productivity, that is, total farm output/total production inputs, have important implications for farmers in terms of their costs of production and their incomes. The purpose of this article is to review the changes which have occurred in agricultural productivity and incomes during the 1960's.

AGRICULTURAL PRODUCTIVITY

Agricultural productivity, or economic efficiency, can be described as the relationship between total farm output (production for market) and total farm inputs (resources used in the production process), with both valued at constant prices. A rising index of agricultural productivity indicates, therefore, that the real (constant price) average costs of producing farm products are declining. In other words, the same output, or greater output is being produced with fewer total resources or the increase in resources used has been proportionately less than the increase in output.

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Since 1960, the gains in overall agricultural productivity in Canada have been an estimated two and a half per cent a year (see Table 1). These gains have come about because total farm output for market has increased by about three and a half per cent a year but the increase in production inputs during the same years was at a lesser rate, or about one per cent per year.

SOURCES OF PRODUCTIVITY GAINS

Crop and livestock output both increased in the 1960's but the expansion in crop production was faster than the rate of expansion in livestock (and livestock product) production. Crop output increased by more than five per cent annually while livestock and livestock product production increased by about two and a half per cent a year. Since the increase in land in farms in the 1960's, and especially improved land, averaged less than one per cent a year, much of this increased crop output has been due to the employment of inputs which substitute for land, such as fertilizers and herbicides.

The overall index of farm inputs rose by slightly more than one per cent a year since 1960. Most of the increase in inputs used was attributable to a four per cent a year increase in the 'capital' inputs grouping. This increase in the capital inputs grouping was offset largely in the total input package by a decrease of about three per cent a year in labor employed in farming. Those inputs described as 'real estate', largely land and buildings, remained almost constant over the decade. The rise in importance of capital inputs is shown by the fact that at the beginning of the decade, these inputs made up about 42 per cent while labor comprised 36 per cent of the total inputs. At the end of the decade, however, capital comprised 55 per cent of the total and labor, 24 per cent.

Within the capital inputs grouping there have been important changes which help to explain some of the gains in farm output and productivity. Purchases by farmers of feed and seed from the nonfarm sector have shown very rapid increases of five per cent a year. Fertilizer use has increased rapidly also with the rate amounting to a four per cent annual rise. Important increases, at somewhat lesser rates, have taken place in farm consumption of electric power, hired custom work, pesticides, herbicides, and livestock services. Increases in machinery and equipment, together with associated supplies, continued to be important factors contributing to rising productivity with inputs in this category increasing at an annual rate of three per cent a year.

This changing nature of the farm input mix has meant increasing economic interdependence between farmers and their nonfarm suppliers of goods and services. The rapidly declining numbers of workers in agriculture, combined with a rising capital use, has meant, too, that labor productivity, that is, total output per man, has increased sharply. The gains can be shown by the fact that today one farm worker can produce sufficient food and fiber to support the equivalent of forty persons compared with a level of support of thirty persons a decade earlier. This represents a one-third increase in labor productivity.

TABLE 1. INDEXES OF FARM OUTPUT, PRODUCTION INPUTS, PRODUCTIVITY (OUTPUT PER UNIT OF INPUT), AND FARM INCOMES, CANADIAN AGRICULTURE, 1960 TO 1969 (1961 = 100)

Year	Farm Output	Production Inputs	Productivity	Real Net Income	
				Total	Per Worker
1960	115	100	115	96	95
1961	100	100	100	100	100
1962	125	100	125	108	112
1963	138	102	135	98	103
1964	129	104	124	107	116
1965	138	104	132	115	132
1966	156	106	148	126	157
1967	137	109	126	117	143
1968	145	108	134	107	133
1969	153	108	142	94	120
		per cent			
Annual Growth rate	+3.6	+1.1	+2.5	+1.1	+4.2

Source: The indexes of output, inputs and productivity are as published by the author in *Canadian Farm Economics,* Vol. 5, No. 5, Dec. 1970 except that they have been converted from a 1949 time base to a 1961 time base. The indexes of real net income were computed from statistics published by the Dominion Bureau of Statistics (Cat. Nos. 21-202, 71-001 and 62-002). In computing these indexes, the total farm labor force was used to calculate the income per worker and the total net income refers to that realized by farm operators, family workers and hired workers from farming operations. The current income was adjusted to a real (constant price) income basis by means of the Consumer Price Index (1961 = 100).

TRENDS IN FARM INCOMES

But how have farm incomes behaved in this period of rising agricultural productivity? Productivity gains are needed for improved real incomes in the longer run but they do not of themselves guarantee this. Productivity gains result from improvements in resource combinations and management but, if the output of farm products increases faster than the demand does, then prices to producers will likely be depressed. This is so because of the generally 'inelastic' demand for most farm products at the farm level. (A one per cent increase in farm output is associated with more than a one per cent decrease in product price and therefore a decrease in total revenue.)

Total net incomes of Canadian farmers and farm workers are estimated to have increased by about three and a half per cent a year in current prices since 1960. After adjusting for the rise in consumer prices, then the increase in real incomes becomes much less or about one per cent a year. Since there has been a considerable reduction in numbers of farmers and farm workers in the past decade, the increase in real net income per worker in farming has amounted to about four per cent a year. These gains in farm incomes represent, of course, the average for the decade. Most of these gains were realized up to 1966. Since then farm incomes have been declining, both in total and per worker, reflecting the depressed farm product markets of those years. Furthermore, even though farm incomes in aggregate and on a per man basis have shown improvements over the decade, some have done better than average while others have not. The rapid rate of decline in numbers of farmers and farm workers in the same period is an indicator that many of them have found that they can obtain better incomes in other occupations. Then, too, many farmers have retired from active farming and have not been replaced by new entrants to the industry.

BENEFITS OF PRODUCTIVITY GAINS

Generally speaking, it has been possible for the primary agricultural industry to retain only a part of its productivity gains in the 1960's—while productivity rose at a rate of two and a half per cent a year, real aggregate incomes in farming increased by one per cent annually. This has come about in part because the increased output associated with rising productivity was not matched by corresponding increases in consumer demand. Hence the rate of increase in real farm incomes was less than the increase in productivity. Consumers of farm products have benefited from rising farm productivity, too, because of the lesser rise in farm product prices than likely would have been the case in the absence of productivity gains. In the longer-term, therefore, it appears that the gains in agricultural productivity in the 1960's were of benefit both to farmers and consumers. ■

WEED CONTROL FOR SUNFLOWERS in western canada

W. O. CHUBB

A cause des mauvaises herbes la culture du tournesol ne s'est pas bien propagée au Manitoba. Des recherches en cours étudient la lutte par herbicides ou par une combinaison herbicides-façons culturales.

Despite market demand, some farmers are reluctant to grow sunflowers because they regard it as a dirty crop, with weed control the limiting factor. In Manitoba, sunflower acreage, which comprises almost the total Canadian production, was 48,000 in 1969 and has been as high as 68,000. While there is a market for greater production, this is not being filled, largely because of a lack of reliable and economic weed control methods.

All of the sunflower acreage now grown is sown in the traditional wide row spacings to permit inter-row cultivation for weed control. Experiments at the Morden Research Station have shown that crop yields can be increased 16 to 20 percent by growing sunflowers with narrower, 12-inch, row spacings. However, this leaves little possible in the way of cultural weed control.

In the traditional wide row spacings, good, early control of a moderate weed infestation, using herbicide or cultural methods, has increased yields by 20 per cent or more. However, cultural methods are not always reliable because suitable weather conditions do not always occur at times critical for control of weeds in a row. Grass weeds, especially green foxtail, are usually not well controlled.

With weed control difficult and not always reliable, growing sunflowers sometimes results in seeding a weed infestation for the crop in the following year. In an effort to improve this situation, and make sunflower growing more acceptable to a larger number of farmers, our weed control studies at the Morden Research Station have been directed to the testing of herbicides alone or in combination with cultural methods.

Our way to classify herbicides is by method of application. They may be applied in the growing crop to control emerged weed plants (postemergence) or placed in the soil where they can attack weed seeds as they germinate.

They may be placed on the soil surface after planting (preemergence), and timely rainfall depended on to move them down into the top soil layer in high enough amounts to attack weed seeds as they germinate; or they may be mixed into the soil before planting (preplant).

Preemergence herbicides may be truly selective or may depend on placement above the crop plant roots for their selectivity. Preplant or postemergence herbicides must be selective, widening the choice of materials used in preemergence applications.

Our herbicide studies have been concentrated on preplant or postemergence applications because preemergence herbicides are generally unreliable for dry land farming in Manitoba. Studies of the weather records over a thirty-year period for central Manitoba showed that dependence on timely rainfall for activation of preemergence herbicides is not practical. For example, in May rainfall of 0.5 inches within 10 days following a dry day, suitable for herbicide application, occurred on the average in only one year out of three. Moreover additional restriction of low wind speeds suitable for spraying on dry days was not examined. Thus the figure of one year in three is probably somewhat optimistic.

Until recently, no herbicide except the wild oat control chemicals diallate (Avadex) and barban (carbyne) was available for effective use in sunflowers in Manitoba. Two selective preplant herbicides are now available. Trifluralin (Treflan) at one pound per acre and EPTC (Eptam) at 3.5 pounds per acre have proven effective in controlling wild oats and green foxtail and some common broadleaved weeds like lamb's-quarters and redroot pigweed. They are ineffective in controlling Cruciferae such as wild mustard and stinkweed. However, herbicide usage is not widely accepted because of the high cost of these herbicides and sunflowers are being grown in widely spaced rows for inter-row cultivation.

In some of our experimental work, lower rates of these two materials, (trifluralin at 0.5 pounds per acre or EPTC at two pounds per acre), for control of green foxtail combined with postemergence harrowing for broadleaf weed control has given acceptable results with lower costs. On plots treated with herbicide, cultivated with field scale equipment and given no special hand care, yield increases of 20 percent or more have been obtained through control of weeds by this method.

Tests with postemergence herbicides have proven less promising. Sunflowers are extremely sensitive to the phenoxy herbicides, such as 2,4-D or MCPA, and cannot tolerate many of the common herbicides used for grass or broadleaf weed control.

As yet, we have found no herbicide or herbicide mixture whose use would permit economic development of the full yield potential of varieties of the crop now available. This is our goal. ■

Dr. Chubb specializes in weed control at the CDA Research Station, Morden, Man.

THE BAKER DAGGER NEMATODE

a new pest of raspberries and strawberries in british columbia

F. D. McELROY

On trouve beaucoup de nématodes des racines Baker dans les fraisières et les framboisières à sol sableux de toute la vallée du Fraser en Colombie-Britannique. Celles-ci peuvent réduire la croissance de 50 à 75%.

The production of raspberries and strawberries on the lower mainland of British Columbia is of considerable economic importance. Acreages of 2,000 and 1,600 respectively give a total return of about $5 million a year. At the CDA Research Station in Vancouver, we continually attempt to increase yields by reducing the losses from disease. One part of this project has been a study of the effect of nematodes on production. During the study we discovered a new nematode pest which causes considerable damage to plants and results in significant yield loss. This unexpected finding is not something unique as scientists can often find unexpected benefits when investigating particular problems.

In surveying the importance of nematodes in this berry producing area, we took soil and root samples from berry plantings that showed poor growth. Similar samples were taken from areas of good growth and the two compared for the presence of plant parasitic nematodes. Two species predominated in areas of poor growth, the lesion nematode *(Pratylenchus penetrans)* and the Baker dagger nematode *(Xiphinema bakeri)*. The presence of the former species was not surprising as it has long been associated with plant damage. In fact we had assumed that this nematode was the only one responsible for damage to these crops. However, the widespread occurrence of the latter species associated with severe plant damage was a surprise that called for careful study. We sampled 67 raspberry and strawberry fields and found 36 fields were infested with this species. In areas of poor growth populations frequently reached 2,000 per 500 cc of soil. Samples taken from virgin areas near berry plantings showed that the species is native to this region of British Columbia. It was often found associated with native trees, especially red alder and broad leaved maple, and was shown to damage several native conifers also.

Fig. 1. Damage to strawberry roots caused by feeding of the Baker dagger nematode.

The Baker dagger nematodes has been found in all of the light soils of the Fraser Valley, but never in the heavy clay soils, even where strawberries and raspberries are grown. This observation is supported by greenhouse studies in which the best nematode reproduction was obtained in loam or sandy soils but the poorest in clay soils. Light, well aerated soils apparently provide an excellent habitat for its reproduction and survival.

Dr. McElroy is a nematologist at the CDA Research Station, Vancouver, B.C.

Fig. 2. A female and larvae of Baker dagger nematode feeding on a root tip.

Fig. 3. Roots of raspberry plants grown in the greenhouse for three months in nematode-free soil (top) and in soil infested with the Baker dagger nematode (bottom).

Plants grown in nematode infested soil are easily recognized by the swellings or galls formed on the root tips (Fig. 1). Associated with the swelling is a characteristic curling of the root giving it a 'fish hook' appearance. The swelling and curling result from feeding by the nematode, primarily at the root tip (Fig. 2). This feeding eventually stops root elongation. In severe infestations the root system may be reduced by as much as 70-80%. Under these conditions the top growth of the plant is stunted and may be pale green or yellow. Such plants are susceptible to adverse conditions such as inadequate moisture or fertility, and attack by other organisms. Not only are yields reduced in terms of number of fruits, but fruit size is considerably smaller.

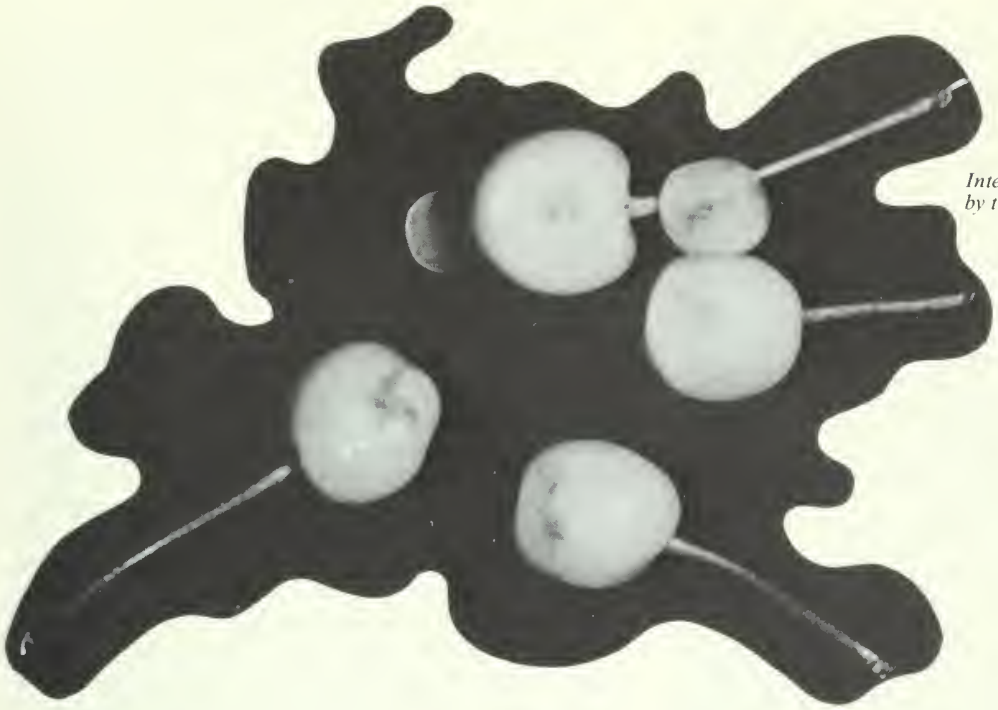
In greenhouse tests raspberry plants grown in nematode infested soil for three months were 75% shorter in linear growth than non-infested plants. The average increase in weight of whole plants growing in infested soil was only 12% of those growing in nematode-free soil (Fig. 3). In strawberry plants the growth was reduced by almost 50% in the presence of the nematode.

A wide variety of hosts were attacked by this nematode in greenhouse tests (Table 1). Approximately one-half of the 27 plants tested supported reproduction of the nematode. Several crops, especially vegetables, which did not support reproduction are commonly grown in areas where the nematode is prevalent. These crops may work in well as rotation crops to reduce populations. However, the fact that several weeds serve as excellent hosts indicates that extreme care must be taken to maintain weed-free fields if this practice is followed.

Chemical control of the nematode should not be difficult so long as treatment is applied before planting. However, there are many young raspberry and strawberry plantings in British Columbia which are infested. These present a problem to the grower because of the considerable expense involved in pulling and replanting a berry field. We are presently attempting to solve this problem. ■

TABLE 1. HOSTS AND NON-HOSTS OF THE BAKER DAGGER NEMATODE, FROM GREENHOUSE TESTS

Hosts		Non-hosts	
Crops	Weeds	Crops	Weeds
Raspberry	Barnyard grass	Bush bean	Broad leaf plantain
Strawberry	Narrow leaf plantain	Pea	Dandelion
Tomato	Lamb's quarter	Ladino Clover	Shepherd's purse
Potato	Corn spurre	Cucumber	
Rye	Common chickweed	Cabbage	
Orchard Grass	Groundsel	Cauliflower	
	Curly dock	Broccoli	
	Mouse-ear chickweed	Brussel's sprouts	
		Corn	
		Turnip	



International browning in Montmorency cherries caused by the green ring mottle virus.

VIRUSES IMPAIR SOUR CHERRY PRODUCTION

WAYNE R. ALLEN

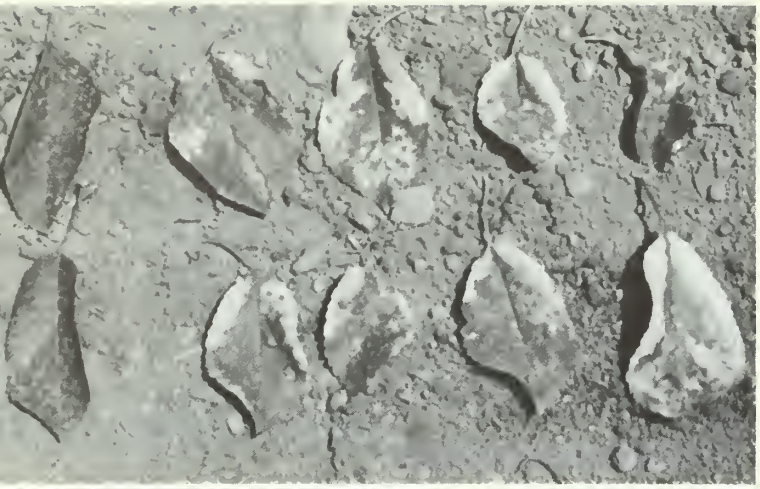
A la Station de recherches du ministère de l'Agriculture du Canada, Vineland (Ontario), on effectue actuellement des essais en vue de lutter contre trois maladies à virus (jaunisse des cerises sures, tache annulaire nécrotique et marbrure annulaire verte) qui réduisent la production et détériorent la qualité des cerises sures.

Unlike most tree fruits, yields per acre of sour cherries have not increased markedly in the past 20 years in Ontario. This is mainly because of virus disease problems.

Virus diseases affecting the sour cherry not only cause reduced yields, but may also cause lessened growth and vigor, and susceptibility to adverse environmental conditions and to other diseases. In the nursery, the effects of viruses are obvious in reduced seed germination and seedling survival, reduced bud take and survival, and lack of uniformity in growth.

At the Vineland Research Station, we are studying the three diseases of major concern to commercial sour cherry production: sour cherry yellows, necrotic ringspot and green ring mottle. These diseases may occur singly or in combination.

Dr. Allen is head of plant pathology and specializes in stone and pome fruit viruses at the CDA Research Station, Vineland, Ont.



Healthy (left) and yellows-diseased leaves of Montmorency sour cherry.

Green rings and spots on leaves of Montmorency cherry infected with the green ring mottle virus.

Constricting or veinal chlorosis symptoms associated with the green ring mottle disease in Montmorency cherry.

The sour cherry yellows disease causes a yearly wave of defoliation of green and yellowed leaves about three weeks after petal fall. Necrotic ringspot is most obvious in the year of initial infection; after that, the trees recover to varying degrees depending on the virus strain involved. With most strains, the symptoms consist of necrotic lines and rings or various chlorotic patterns. The green ring mottle disease has three distinct symptoms: green rings which become more evident as the infected leaves yellow and are eventually cast, constricting chlorosis or yellow vein banding that results in minimal leaf expansion in the affected area and causes eventual leaf twisting, and patches or ring-shaped zones of necrotic tissue in the flesh, often resulting in lumpy, discolored fruits.

If plantings are initially virus-free, we have found that sour cherry yellows disease infection may not appear for about eight years. Little or no necrotic ringspot virus is usually detected for about six years. If all trees in a new block are not virus-free, or if virus-free trees are used as interplants in infected orchards, the rate of spread is markedly greater. By the fifth year, infections of sour cherry yellows disease are obvious and can reach the 50 percent level by the eighth year. Spread of necrotic ringspot is faster, with the disease usually detected in new trees by the third year. By the sixth year, a 50 percent incidence is common. The green ring mottle virus also spreads into new plantings and replants in infected orchards. However, the rate of spread of this virus is considerably slower, probably not exceeding 20 percent over six to seven years.

Measurement of yield losses due to virus diseases is difficult because of the modifying influence of such factors as soil type, drainage, nutrient level and availability, and low temperature exposure. Nevertheless, it is well documented that the necrotic ringspot disease alone can reduce yields by as much as 60 percent and that these substantial reductions occur in the year during which the largest portion of the tree is showing pronounced symptoms. Subsequently the symptoms become less apparent and the tree may recover to approximately 90 percent of the production level obtained with healthy trees.

Sour cherry yellows commonly reduces production by 50 to 60 percent, but unlike the necrotic ringspot disease, recovery in yield seldom occurs. In fact, production will continue to decline unless therapeutic measures are taken. These losses are attributed to reduced pollen germinability and fruit set as well as to an altered leaf-to-flower bud ratio which results in the unproductive, bare-branch condition characteristic of the disease.

Yield reductions caused by the green ring mottle virus are not well documented, but generally fruits on infected trees are commercially unacceptable due to impaired flavor, internal browning and an irregular

surface. On the other hand, fruit quality is not usually impaired by either ringspot or yellows diseases. Ringspot-diseased trees usually have smaller fruits only in the year that shock symptoms appear, with size reductions ranging from 0.5 to 10 percent. The fruits are larger on yellows-infected trees and values as high as 11 percent have been reported. The greater fruit size is probably due to reduced growth of fruit spurs and fruit set. Fruits on yellows-affected trees may also be substantially higher in soluble solids, color and firmness.

The key to virus control is the production of virus-tested stocks. New plantings must be started with 100 percent clean trees, and should be situated as far as possible from infected trees. We have found that even a distance of 75 to 100 yards is helpful.

We have also found that nutrition, irrigation and the use of growth-controlling chemicals will help control losses due to virus diseases in sour cherries. Maintenance of high vigor helps alleviate losses due to virus infection and the maintaining of balanced nutrition helps to offset the damaging effects of disease. Limited field trials and glasshouse studies indicate that diseased trees can benefit by applications of phosphorus and potassium, slightly in excess of normal recommendations.

Our studies also indicate that sour cherry responds well to supplemental irrigation during periods of low moisture. Moisture stress would therefore be even more critical for virus-infected trees especially if hot weather accompanies a dry period.

Enations, mottle, and ringspots in leaves of English Morello sour cherry infected with the necrotic ringspot virus.

Bark splitting in trunk of Montmorency cherry tree infected with the necrotic ringspot virus.

Growth regulating chemicals are receiving considerable attention around the world. We have found that gibberellic acid, in particular, is proving to be useful in alleviating some of the effects of the yellows disease. When properly applied the chemical increases the vegetative-to-flower bud ratio thus decreasing bloom and preventing further development of the bare-branch condition. Increases in vegetative buds on thoroughly infected trees have ranged from 10 to 30 percent and increases in yield have been concurrent. Trees should be pruned when gibberellic acid is used. We have found it best to make cuts back to two or three year old wood to remove the bare-branch areas and to stimulate lateral branching.

These three tree fruit diseases will be difficult to eliminate on an industry-wide basis unless control practices are taken seriously by every cherry grower. These practices, and especially the use of virus-tested stock, are aimed at diluting the incidence of each disease to the level where the rate of spread is reduced to a point where eradicative measures are made more effective. The poor practices of one grower or nurseryman can undo the conscientious achievements of many in virus disease control. ■

ECHOES
FROM THE FIELD AND LAB

Leaf of the *Scopolia sinensis,* a plant which can be used to identify potato spindle tuber virus. (see story below.)

Voici une feuille de *Scopolia sinensis,* une plante que l'on peut utiliser pour la détection du virus de la filosite des pommes de terre. (voir texte à droite).

NEW VIRUS TEST FOR POTATOES Scientists at the CDA Research Station, Fredericton, N.B., have discovered a plant that can be used to identify accurately a troublesome potato virus. The discovery could be a major benefit to Canada's booming seed potato industry, because Canadians want potatoes that are free of virus diseases that influence yield and quality.

Canada has already developed one of the world's best disease-control programs for seed potatoes, and this has enabled our producers to capture a sizable share of world markets.

The plant, scientifically named *Scopolia sinensis,* can be used to identify potato spindle tuber virus, one of the most important virus diseases our Canadian producers wish to avoid.

There are other indicator plants that can be used to identify potato spindle tuber virus, but the symptoms can sometimes be confused with other diseases. This new plant will react specifically to potato spindle tuber virus, providing scientists with a much more precise and accurate identification tool.

During the search for this plant, more than 300 different plant species were tested over a six-year period. The new plant will show disease symptoms seven to 10 days after the virus has been injected. If the virus strain is less severe, symptoms will appear in ten to 15 days. This is a relatively quick re-action, and rapid identification is an important factor.—R. P. SINGH, FREDERICTON, N.B.

PLANTE DÉTECTRICE D'UN VIRUS PARTICULIER Une plante peut être utilisée pour identifier avec précision un virus qui attaque la pomme de terre d'après les scientifiques de la Station de recherches du ministère de l'Agriculture du Canada à Fredericton, N.-B. Cette découverte pourrait être d'un intérêt majeur pour notre industrie florissante des pommes de terre de semence, car nos clients désirent des tubercules exempts de maladies à virus qui ont une influence sur le rendement et la qualité.

De tous temps, le Canada a appliqué l'un des meilleurs programmes mondiaux de lutte contre les maladies des pommes de terre de semence, ce qui a permis à nos producteurs d'acquérir une part appréciable des marchés mondiaux.

Le nom scientifique de cette plante est *Scopolia sinensis* et elle peut être utilisée pour la détection du virus de la filosité des tubercules.

Il s'agit là de l'une des plus importantes maladies à virus, dont les producteurs canadiens désirent éviter les attaques. D'autres plantes peuvent servir à la détection de ce virus, mais il y a alors risque d'en confondre les symptômes avec ceux d'autres maladies. La réaction de cette plante est spécifique au virus de la filosité des tubercules, ce qui fournit aux chercheurs un matériel d'identification plus précis et plus exact.

Au cours des recherches plus de 300 variétés ont été analysées en six ans. Les symptômes de la maladie se manifestent sur cette plante de sept à dix jours après l'injection virale. Dans le cas d'une souche moins virulente, les symptômes apparaissent au bout de 10 à 15 jours.

La réaction se produit donc avec une rapidité relative et l'on sait combien une prompte identification est un facteur important.—M. R. P. SINGH, FREDERICTON, N.-B.

OTTAWA TEXTURE MEASURING SYSTEM Production of the Ottawa Texture Measuring System, developed by scientists in the CDA Engineering Research Service, has been started by Canners Machinery Limited at Simcoe, Ont.

The system is the first inexpensive, general purpose instrument capable of handling a wide range of textural measurement economically in both industrial quality control and research activities. It can handle a wide range of foods, including measurement of the tenderness of peas and meat, hardness of beans, the firmness of fruits and textural characteristics of many uncooked and processed foods.

In addition to its value as a quality control instrument, the system is a useful research tool, helping scientists to evaluate the textural quality factors in breeding new varieties, developing new mechanical harvesting techniques, new food products and food processing systems.

Texture, an increasingly important quality attribute in foods, is not yet fully understood. Its measurement, therefore, cannot be placed on a fully scientific basis. To develop routine methods for quality control in the production line requires laboratory research. To move the measurement from the laboratory to the production line is greatly simplified with the Ottawa Texture Measuring System. The same instrument, stripped of the frills necessary in the laboratory, can move directly to the quality control department.

The key to the new system is two new texture test cell designs. These cells are containers, installed in a simple, but rugged press. Food is put into the container and the press forces it through either a wire grid or a perforated plate covering the bottom of the container. The forces are measured electronically and, by analyzing the records, the firmness and toughness of the product can be determined. On the production line, the read out would be displayed as a single number.

The new equipment has already been compared with several existing and expensive instruments and the results for a wide range of foods agree.

The principal advantages of the new equipment are its low cost, ease of cleaning and minimum replacement costs for worn or damaged critical parts. And the test cell can be tailored to test specific products.—PETER W. VOISEY, CDA ENGINEERING RESEARCH SERVICE, OTTAWA, ONT.

NEW BUCKWHEAT VARIETY LICENSED Tempest, a new buckwheat variety, has been licensed by the Canada Department of Agriculture. It was developed at the CDA Research Station, Morden, Man., from a selection of a Russian introduction made at the CDA Research Station, Ottawa, Ont.

Tempest outyielded the popular variety Tokyo by 11 per cent in 10 tests over five years at three Manitoba points. It was tested in Ontario and Saskatchewan during 1970 and yielded better than Tokyo in some localities.

The seed of Tempest is slightly smaller than Tokyo. Samples grown in 1970 were sent to Japan for quality assessment. The Japanese buckwheat milling industry reported that flour from Tempest is superior to Tokyo in taste and flavor.

A select group of growers will receive the first distribution of Breeder and Select seed from the Seed Section, CDA Research Station, Regina, Sask., through the Canadian Seed Growers' Association Stock Seed Committee of Manitoba.—S. T. ALI-KHAN AND E. O. KENASCHUK, MORDEN, MAN

ECHOS
DES LABOS ET D'AILLEURS

CHARBON DE L'OIGNON Selon une enquête systématique effectuée par la Station de recherches du ministère de l'Agriculture du Canada à Saint-Jean, Qué., près de la moitié des cultures d'oignons produites dans les sols organiques de la région du sud-ouest du Québec sont infestées de charbon.

L'enquête avait pour but de déterminer les emplacements atteints, l'intensité de la maladie et les pertes qu'elle occasionne.

On a choisi 44 fermes représentant 60% des producteurs d'oignons et 70% des superficies consacrées à cette culture.

Sur les 44 fermes examinées, les cultures de 21 d'entre elles étaient atteintes de charbon, soit 47.7%. Sur un total de 1,382 acres examinées, 585 (42.3%) étaient contaminées. Les pertes s'élevaient à 1,885,920 livres d'oignons, ce qui fait, à un prix moyen de .03 cents la livre, un montant de $56,777.60.

En ce qui concerne la maladie, M. René Crête, qui participait à l'enquête, a constaté que beaucoup de producteurs emploient de préférence le traitement par sillon plutôt que la désinfection de la semence, parce qu'il est plus facile.

Il pense que le traitement par sillon, dont les résultats sont moins bons, et l'emploi de produits chimiques partiellement efficaces seraient à l'origine de ces pertes soutenues.

NEW BLUEGRASS PROMISING Nugget, a new Kentucky bluegrass variety, should be widely tested. It is considered by scientists at the CDA Research Station, Agassiz, B.C., to be one of the most interesting bluegrass varieties in the Station's present bluegrass trials.

It is a dwarf variety and originated at the Alaska Agricultural Experimental Station. It appears to have different growth characteristics than most of the varieties under test.

Plots of Nugget were established at Agassiz in June, 1969, and were compared with 30 other varieties. These included Merion, Park, Fylking 02-17 and Windsor.

The hardy new bluegrass with its excellent dark green color was given a top monthly rating for appearance between April and September, 1970. However, during the winter it lost much of its green appearance and ratings were low.

This could be a drawback along the mild British Columbia coastal region, but it wouldn't be so serious in the colder regions where there are early frosts and a snow cover.

Nugget also showed a marked tendency to produce seeds even when it was mowed to three-quarters of an inch, but the heading period was short.—D. K. TAYLOR, AGASSIZ, B.C.

NEW INSTITUTE FORMED Dr. B. B. Migicovsky, director general of the Canada Department of Agriculture's Research Branch, Ottawa, Ont., has announced formation of the Chemistry and Biology Research Institute.

The new institute replaces the Cell Biology Research Institute and the Analytical Chemistry Research Service.

Dr. Rolf M. Hochster, former director of the Cell Biology Research Institute, heads the new organization.

A three-pronged research program is planned.

There will be a basic research effort to discover new information about crop production under Canada's cold climatic conditions. This will include investigations into winter survival of plants, processes of frost hardiness and dormancy in cereal seeds and in fungal spores. The dormancy research will zero in on the phenomenon that enables some seeds and fungal spores to lie dormant during the cold of winter and to germinate under more suitable growing conditions in the spring.

The institute will also investigate the complex relationships among plants, bacteria and fungi. There will be research into the interactions between host plants and their parasites, particularly into the reasons why some plants are resistant to pests and disease while others are not.

The third prong of the research effort involves service functions in support of other research within the CDA's Research Branch. There will be four groups specializing in chemical analysis (including back-up research into new methods of analysis); electron microscopy; instrumentation, and expert glass blowing.

PORK MARKETING STUDY The Canada Department of Agriculture, in co-operation with the Department of Industry, Trade and Commerce, is conducting a study of North American and world markets for pork.

The study was initiated at the request of the Canadian Swine Council and the Meat Packers Council of Canada. The major emphasis is on potential levels of hog and pork trade (exports and imports) between Canada and the United States.

A major part of the project involves obtaining primary data and opinions from producers, wholesalers and retailers in Canada and the United States.

The survey will provide information useful in estimating the influence on pork trade of factors such as type of product, quality, costs, promotion and competition from products of other countries.

The competitive position of selected hog production areas in Canada and the United States will also be examined. Potential pork exports to countries such as Japan and some European countries will be studied, and Canada's ability to compete with major exporting countries such as Denmark, Holland and Poland.

The overall project is under the direction of Dr. Donald A. West, Economics Branch, CDA, Ottawa. The market survey team is led by Dr. Murray H. Hawkins, University of Alberta, and includes Ralph K. Bennett, former director, Livestock Division, CDA, Ted Crowston and Laval Lefebvre, Department of Industry, Trade and commerce, and Alan M. Boswell, Economics Branch, CDA.

An initial report on the project is planned for this fall.

KANE ALFALFA A new high forage yielding alfalfa named Kane has been licenced by the Canada Department of Agriculture. It was developed at the CDA Research Station, Lethbridge, Alta.

It is suitable for both irrigated and dryland hay or pasture production.

Kane tested highest among 22 strains and varieties of alfalfa in uniform alfalfa tests between 1965 and 1969. Tests were held at seven locations across western Canada. it surpassed Ladak by three per cent and Roamer by seven per cent and in irrigated tests was about the same as Beaver.

Forage yields were particularly good at Swift Current and Saskatoon, Sask., and Beaverlodge and Lacombe, Alta.

The new variety is equal to Roamer and Beaver in wilt resistance and is equal to Roamer in winter hardiness. It is a creeping-rooted, six-clone synthetic variety. Its parentage is similar to that of Roamer, and, like Roamer, it combines some of the better characteristics of both Rambler and Beaver in one variety.

While Kane did not excel in seed yields in the uniform alfalfa tests, it is felt that yields will be adequate under the intensive management associated with pedigreed seed production.

NEW CREEPING RED FESCUE VARIETY Scientists at the CDA Research Station, Ottawa, Ont., have developed a new variety of creeping red fescue which shows a marked resistance to leaf spot disease.

It has been named Durlawn. It combines well with Merion Kentucky bluegrass and Norlea perennial rye grass in lawns where water supplies are limited.

Durlawn is not as vigorous as Boreal, but it recovers well after defoliation and forms a dense sod, particularly when combined with other grasses.

It has a strong creeping habit and wide, deep green leaves which hold their color throughout the growing season. Seedling growth and establishment are good.

The new variety is a 20-clone synthetic. The clones, initially derived from 200 clones, were finally united on the basis of performance in comprehensive progeny tests. Final testing and evaluation was on second- and third-generation seed.

TESTING GRAPE CULTIVARS IN NOVA SCOTIA

Vineyard, Miner Stevens Farm, Melanson, Gaspereau Valley, Kings County, Nova Scotia.

D. L. CRAIG

Depuis 1913, diverses variétés de raisins ont subi des essais à la station de recherches de Kentville. Les chercheurs nous ont prouvé qu'on peut avoir des raisins de table mais les recherches se poursuivent pour obtenir un raisin hâtif pour la fabrication du vin.

Testing of grape cultivars (varieties) has gone on continuously at the CDA Research Station, Kentville, since 1913. More than 100 cultivars have been evaluated in the search for a grape that would grow well in Nova Scotia.

A record of the first (1913) planting at Kentville shows that it contained 36 cultivars. Included were Diamond, Delaware and Concord—cultivars which are still of commercial importance in British Columbia and Ontario. Other cultivars such as Telegraph, Merrimac and McTavish have long since fallen by the wayside.

The many years of testing revealed little of value until the early 1950's when it became evident that the cultivar Van Buren, from the New York Fruit testing Station at Geneva, held considerable promise—the fruit was blue and early maturing, and the vines productive and winter hardy. The cultivar Fredonia from the same source and very similar to Van Buren has also proven satisfactory but the fruit was not quite as acceptable as Van Buren.

The establishment of two wineries in the Atlantic region during the early 1960's resulted in a request for information on the suitability of the area for wine grape production. The cultivars Van Buren and Fredonia are being produced in Nova Scotia on a commercial basis for the roadside stand trade but the wineries prefer to use grapes free from the 'foxy' flavor that is present in *Vitis labrusca* types such as Van Buren.

We were aware that many people in Nova Scotia grow a few grapes for home use. The vines are generally well protected from the prevailing wind and are often trained on the south side of an 'out building' where they gain extra heat to speed fruit maturity. A survey was made of these vines with the hope that someone would have a grape that would be of value for wine production. No such grape was found. Most were of the Concord type and although some of the vines were very old and still productive they were not the answer.

The rather specific wine grape requirements of high soluble solids, low acid content, and freedom from 'foxy' flavor led to the establishment in 1963 of new test plantings of grape cultivars more typical of the

Harvesting Van Buren grapes, Miner Stevens Farm, Melanson, Kings County, Nova Scotia.

Dr. Craig is head of plant breeding at the CDA Research Station, Kentville, N.S.

European wine grape *Vitis vinifera.*

Three planting sites were chosen in the Annapolis-Cornwallis Valley area. Two of the locations, Acaciaville and Bear River, are some 70 miles west of Kentville; Melanson, the third location, is in the Kentville area in the eastern part of the Valley. All sites had a slope. The exposure was southern at Melanson and Acaciaville and western at Bear River.

In the spring of 1963, 8-10 vines of the cultivars Foch, Seibel 5279, Seibel 9549, Seibel 10878 and standards such as Delaware, Van Buren and Concord were planted at each location. Planting distances were 10 ft. by 10 ft. The vines were trained to the 4 cane Kniffen system and pruned to the balance system.

Yield data, winter injury and juice analysis (soluble solids, pH and titratable acidity) have been recorded from these plantings since 1965. Cultivars such as Foch and Seibel 9549 yielded 20 or more pounds of fruit per vine 6 years after planting, thus yield is not a limiting factor. Winter survival of vines varied. Cultivars such as Foch and Seibel 9549 were completely hardy while Seibel 5279 and Seibel 10878 were rather severely injured when we experienced an unusually cold winter.

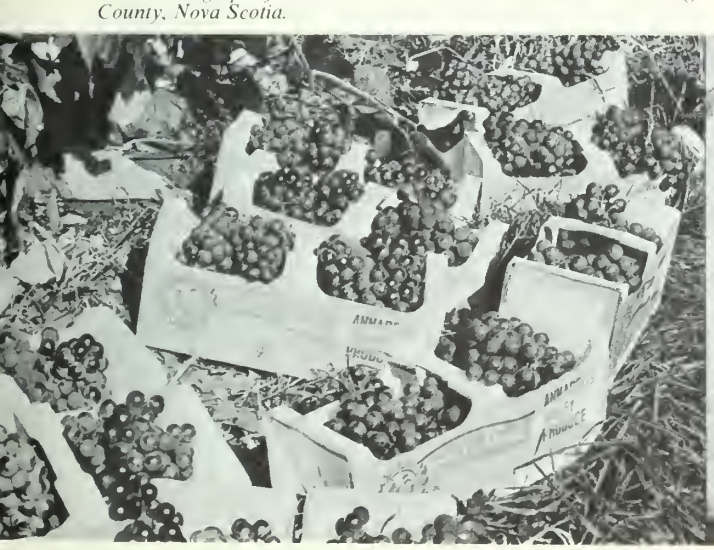
When we compared our juice values for soluble solids, titratable acidity and pH acceptable values for the same cultivars grown in Ontario and British Columbia it became apparent that our values for titratable acidity were much higher and pH values much lower. With few exceptions, values for soluble solids were also lower. This indicated that even fruit from the Melanson site, our best location, was not entirely mature at the end of the growing season.

In addition to the foregoing data we also obtained plant tissue samples from 1966 to 1969 inclusive. These samples, obtained from 3 of the more promising cultivars at each location, were analysed for total N, P, K, Ca and Mg. A comparison with data from vines grown in areas producing wine grapes commercially suggested that the nutritional status of the vines in the test plots was reasonably satisfactory.

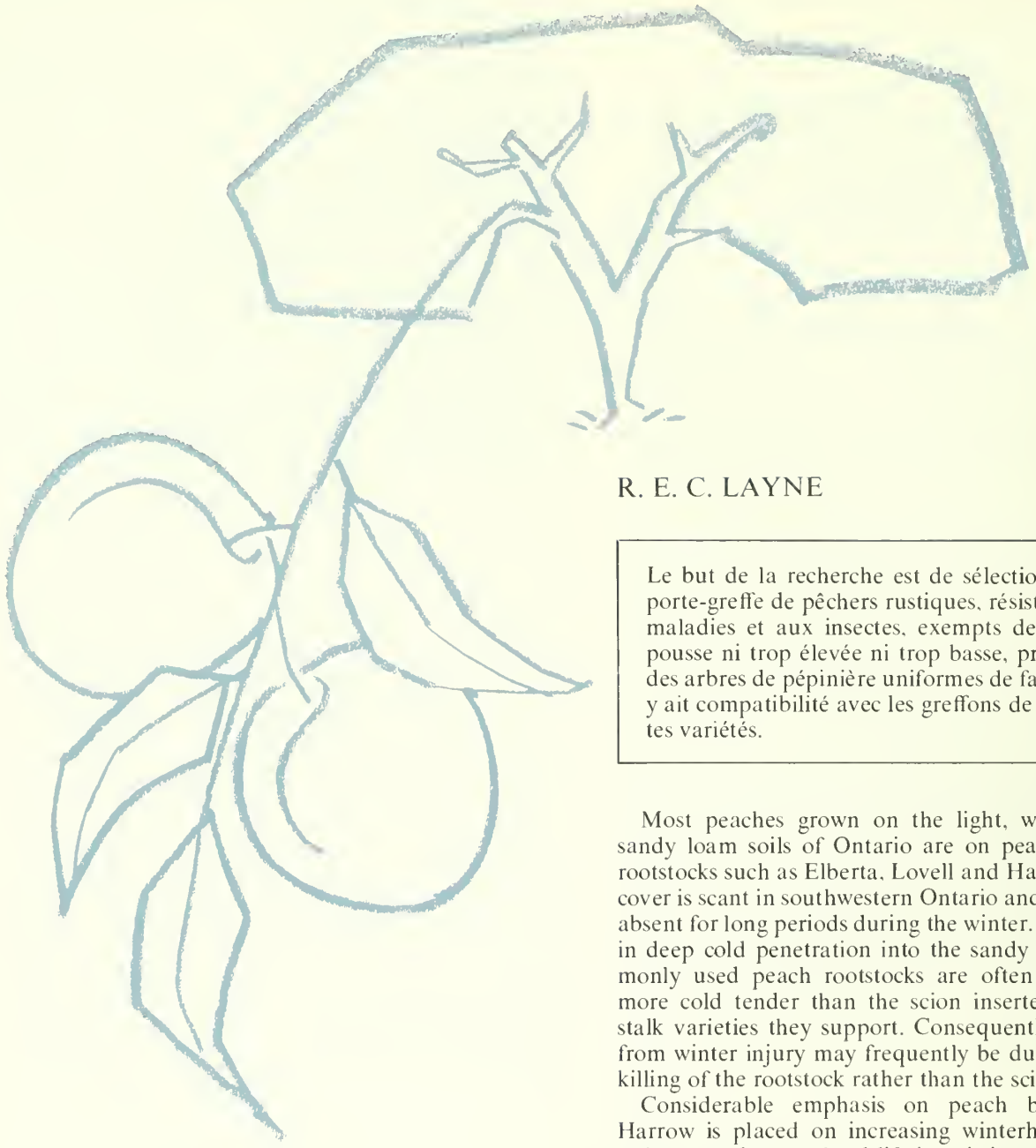
It is generally accepted that even the earliest maturing cultivars require a heat unit accumulation of at least 1500 degree-days over 50°F and because of vine injury winter temperatures should not fall consistently below −15°F. Kentville weather records suggest that Melanson is well within this requirement while Bear River and Acaciaville are rather cooler. For example, degree days, 50°F base, at Melanson for 1965 to 1969 inclusive were 1451, 1724, 1942, 1747 and 1850 respectively, but in 4 of the 5 years 82 to 87% of the accumulated heat units occurred by September 1. It is an accepted fact in other grape producing areas that warm temperatures during the last few weeks prior to harvest are a requisite to proper maturity. We can only conclude that our failure to obtain a desirable degree of maturity is the lack of sufficient heat units during September.

Our research has shown that we can produce grapes that are suitable for the basket trade. However, early maturing cultivars that are extensively planted in British Columbia and Ontario for wine purposes do not appear to be adaptable to our maritime climate. Our hope for a wine grape now lies in a number of very early maturing selections we secured from the Ontario and New York grape breeding programs. On the 14 selections that have been on test since 1966 at the Kentville Research Station 3 (N.Y.17101, N.Y.30011, Vineland 37034) have produced grapes whose juice meets the requirements for wine. Whether in fact they will be hardy and productive and make an acceptable wine remains to be seen. ■

Van Buren grapes from the Miner Stevens Farm, Melanson, Kings County, Nova Scotia.



The author showing Van Buren grapes at the Miner Stevens Farm at Melanson, Kings County, Nova Scotia.



PEACH ROOTSTOCK RESEARCH AT HARROW

R. E. C. LAYNE

Le but de la recherche est de sélectionner des porte-greffe de pêchers rustiques, résistants aux maladies et aux insectes, exempts de virus, à pousse ni trop élevée ni trop basse, produisant des arbres de pépinière uniformes de façon qu'il y ait compatibilité avec les greffons de différentes variétés.

Most peaches grown on the light, well-drained, sandy loam soils of Ontario are on peach seedling rootstocks such as Elberta, Lovell and Halford. Snow cover is scant in southwestern Ontario and sometimes absent for long periods during the winter. This results in deep cold penetration into the sandy soils. Commonly used peach rootstocks are often genetically more cold tender than the scion inserted onto the stalk varieties they support. Consequently, tree loss from winter injury may frequently be due to winter-killing of the rootstock rather than the scion variety.

Considerable emphasis on peach breeding at Harrow is placed on increasing winterhardiness in order to prolong orchard life in existing peach growing regions, and to permit expansion of the industry into new regions where the climatic conditions are even less favorable. Regardless of the progress made in breeding hardier varieties of peach, however, efforts at prolonging orchard life and productivity will surely fail unless we can also significantly improve winterhardiness of peach rootstocks. Therefore, we are also placing great emphasis on breeding and selecting peach rootstocks that are winterhardy, disease and insect resistant, have size controlling ability, produce uniform nursery trees that are broadly compatible with scion varieties, and are virus free. We have made some progress in this direction already, especially in the area of increased hardiness and size

The author is a fruit breeder and pathologist at the CDA Research Station, Harrow, Ont.

controlling ability, but further research will be required to incorporate disease and nematode resistance into these hardy rootstocks.

In 1967 we released two hardy, size-controlling seedling rootstocks for peach that were selected by Dr. G. M. Weaver. We have now established a seed orchard of certified, virus-tested stock of both varieties. Distribution and sale of seeds and budwood from this orchard at Harrow is managed by the Western Ontario Fruit Testing Association. Last year the association distributed 260,575 seeds of Siberian-C and 13,100 seeds of Harrow Blood to universities, research stations, nurseries and growers in Canada, the United States, South Africa and Europe. Extensive second test of these stocks will be required to establish their ultimate value to the peach industries of different regions.

Siberian-C was selected from hardy open pollinated seedings of *Prunus persica* var. Siberica which was introduced from Poland, but originated in Northern China. When grown as a scion the trees are spreading, have wide crotch angles and are exceptionally productive, bearing heavily in the third year. The fruits are small, white-fleshed and semi-clingstone, but becoming free when fully ripe. Siberian-C matures in the same season as Elberta. It produces pink, small, non-showy blossoms and displays unusual tolerance to late spring frosts. It also hardens off earlier in the fall than other varieties and defoliates several weeks earlier than normal. As a scion variety Siberian-C is extremely winterhardy and significantly exceeds the hardiness of any of the North American cultivars of peach. In comparison with Harrow Blood it gains hardiness at a faster rate in the fall and attains a slightly greater level of hardiness during the winter months. In the spring Siberian-C begins growth sooner than Harrow Blood and loses hardiness at a faster rate.

Siberian-C as a sub-propagated rootstock germinates readily, produces uniform trees that are compatible with a broad range of scion varieties. In the Fall the wood matures at least two weeks earlier than normal varieties, so this rootstock should be budded first. It promotes early defoliation of the scion varieties in the nursery row, allowing for earlier digging and reducing the possibility of leaf scar infection by peach canker while still in the nursery. Scion varieties budded on Siberian-C tend to be 10-15% smaller than on standard seedling rootstocks such as Halford. They come into bearing one year sooner, and tend to defoliate earlier in the fall than on other rootstocks tested. Siberian-C also tends to impart a greater level of hardiness to the scion variety than Halford, Veteran or Harrow Blood. It is too early to tell what the ultimate size controlling level of Siberian-C will be on mature bearing trees, but a spacing of 14 × 20 resulting in 155 trees per acre appears possible, especially with low vigor scion varieties. High vigor scion varieties such as Babygold 5 may require a wider spacing in the tree row. Siberian-C does not have any appreciable resistance to root lesion or root knot nematodes, or crown gall. In regions where rootstock resistance to nematodes is essential, Siberian-C may still have a place as a hardy stem builder and framework for less hardy peach varieties.

The Harrow Blood rootstock was selected as a chance seedling on account of its hardiness, productivity, and compact growth habit. It produces small, white-fleshed fruits, heavily pigmented with anthocyanins. They are freestone and mature three weeks after Elberta. Blossoms are large, pink and showy. Harrow Blood has shown some tolerance to peach tree borer and peach canker.

As a rootstock, Harrow Blood is not as easy to handle as Siberian-C but it has greater size controlling ability, producing trees that may be over 20% smaller than standard. This will permit closer planting in the tree row, such as 10 × 20 with low vigor scion varieties (218 trees to the acre), or 12 × 20 with higher vigor scion varieties (181 trees per acre). Seeds of Harrow Blood have a longer chilling requirement than Siberian, and should be started in the greenhouse a month before transplanting to the field to ensure a high percentage of buddable trees. In Ontario they can be budded until mid-September, which compensates somewhat for their slower growth. Varieties budded on Harrow Blood defoliate a little later than on Halford or Veteran and appear to have a lower incidence of bacterial leaf spot. Unlike Siberian-C, Harrow Blood does not appear to impart greater precocity or hardiness to the scion variety and is more comparable with Halford, Bailey or Veteran rootstocks in this respect. Harrow Blood has no appreciable resistance to root lesion nematode or crown gall, and its resistance to root knot nematode is not yet fully established.

Our rootstock research is now continuing with two even hardier stocks than Harrow Blood and Siberian-C introduced from Harbin province in Northern China by way of Poland. They are Tzim Pee Tao and Chui Lum Tao. It is too early to say what their advantages may be and whether they will be sufficient to merit introduction. This will be established with further research.

Peach seedling rootstocks have significant influences on scion varieties, affecting such characters as crotch angle, size control, growth habit, time of defoliation, disease susceptibility, precocity of bearing and productivity, and even winterhardiness. If we can harness these benefits and combine them with the best and hardiest of our scion varieties, then the possibility of prolonging orchard life and productivity is at hand, and the potential for higher density plantings with greater yields per acre is well within reach. ■

STORAGE ROT OF APPLES

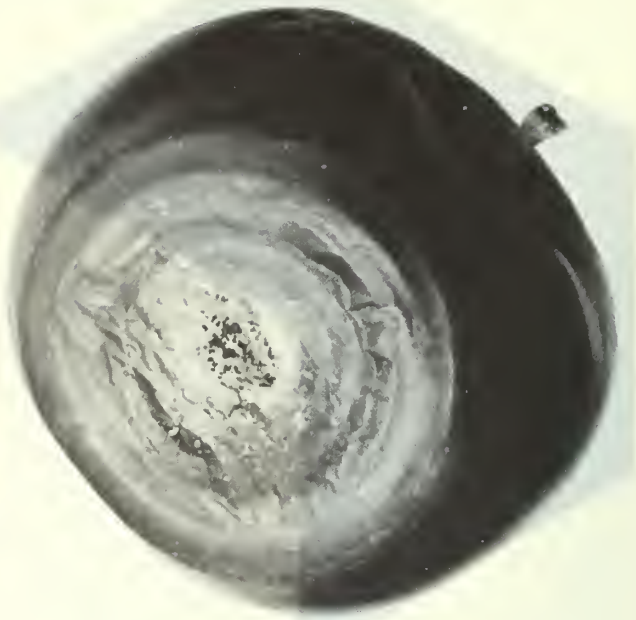


Fig. 1. Gloeosporium *album rot of McIntosh apple.*

C. L. LOCKHART

Les travaux de recherche ont démontré que les pourritures d'entrepôt des pommes peuvent être réprimées par la pulvérisation, la manutention appropriée, de bonnes méthodes sanitaires, l'entreposage des fruits aux températures recommandées et l'utilisation d'entrepôts à atmosphère contrôlée.

Decay of apples in storage has been a problem for apple growers for many years. It still is a problem even though progress in controlling rot losses has been made. Storage rot losses in McIntosh apples in Nova Scotia over a 7-year period from 1962 to 1968 were 4.8 percent. In 1962 the rot losses were 7.4 percent but in 1968, with newer control measures and advances in storage methods, the rot losses were reduced to 2.8 percent.

At Kentville, we found that several fungi caused rots on apples in storage. Important rot pathogens are *Gloeosporium* spp., *Penicillium* spp., and *Botrytis cinerea.* Organisms of minor importance are *Alternaria* sp., *Phytophthora syringae, Sclerotinia sclerotorium* and *Sphaeropsis malorum.*

Three species of *Gloeosporium* are involved in the rot complex commonly called "storage rot" or "anthracnose." In Nova Scotia *Gloeosporium album* (Fig. 1) is the most prevalent followed by *G. malicorticis* and *G. perennans.* These three fungi commonly live on apple trees and produce cankers. The fungus growing on these cankers or infection sites produce spores during wet weather to provide inoculum for infection of immature apples. Infection generally occurs during wet weather in August and September and outbreaks of rot on stored apples have been correlated with wet periods of three or more days. Infections on immature apples remain inactive until the apples are harvested and in storage. Because of this, field infections are commonly referred to as latent infections.

We have found that development of *Gloeosporium* rots on apples in storage is influenced by such factors as nutrition during the growing season, storage temperatures, and concentrations of carbon dioxide, oxygen and ethylene in controlled atmospheres. For example, apples grown on trees fertilized with a high rate of nitrogen usually show a higher incidence of *Gloeosporium* and develop more rots than those grown under a low nitrogen treatment. Normally *Gloeosporium* rots require three to six months to develop on apples stored at 38° F but they will develop a similar amount of rot in four to five weeks at 65° F. In controlled atmosphere storage in the absence of carbon dioxide a marked increase in the number of *Gloeosporium* rots occurs in an atmosphere of 15 percent oxygen with lesser amounts at higher and lower concentrations of oxygen (Fig. 2). In the presence of 5 percent carbon dioxide the number of rots is supressed. Outbreaks of *Gloeosporium* rots have occurred on apples held in nearly air tight containers and it is now known that these outbreaks of rots were

The author specializes in fruit and vegetable storage diseases at the CDA Research Station, Kentville, N.S.

due to stimulation of the fungus by oxygen levels near 15 percent. Rots of McIntosh apples have been kept at a minimum in controlled atmosphere by maintaining an atmosphere of 5 percent carbon dioxide and 3 percent oxygen. Research at Kentville has also demonstrated that ethylene, a volatile product produced by apples, plays a significant role in suppressing rots in storage. Concentrations of 800 to 3600 ppm of ethylene were comparable to 5 percent carbon dioxide in suppressing *Gloeosporium* rots on apples.

Late cover sprays of the fungicide captan applied in mid August and late August give satisfactory control of *Gloeosporium* rots.

Penicillium (Fig. 3), a wound pathogen, develops in storage on apples wounded by stem punctures and bruises caused by rough handling at harvest time. Serious outbreaks of *Penicillium* rots have generally been associated with the use of old or dirty storage containers. The newly adapted practice of using water dumpers in grading operations has led to an increase in the number of *Penicillium* rots on apples in the United States. This problem has not appeared in Nova Scotia, but could be a potential problem since samples from commercial water dumpers had high *Penicillium* counts in water which had not been changed for a week or more, whereas, in water changed daily the *Penicillium* counts were at a low level. Changing the water daily in the dumpers would reduce the potential inoculum. Recent research has demonstrated that a thiabendazole post harvest dip is very effective in controlling *Penicillium* rots of apples. At the present time the fungicide thiabendazole is not registered for use on apples.

Gray mold or *Botrytis cinerea* (Fig. 5) can cause various losses of apples in storage. It develops rapidly and often produces nests of rots because it spreads from one apple to another.

The only other storage rot of any significance is one caused by *Phytophthora* (Fig. 4). Recently this disease was found on McIntosh and Delicious apples. We found that infection appeared to occur when harvested apples were left in the orchard in boxes through a rainy period. The infection resulted when the fungus reached the apples in water and soil particles splashed from the ground.

Our research has shown that satisfactory control of storage rots can be accomplished by: following the recommended spray schedules, through proper handling and good sanitation practices, storing the fruit at recommended temperatures, and by use of controlled atmosphere storages. ■

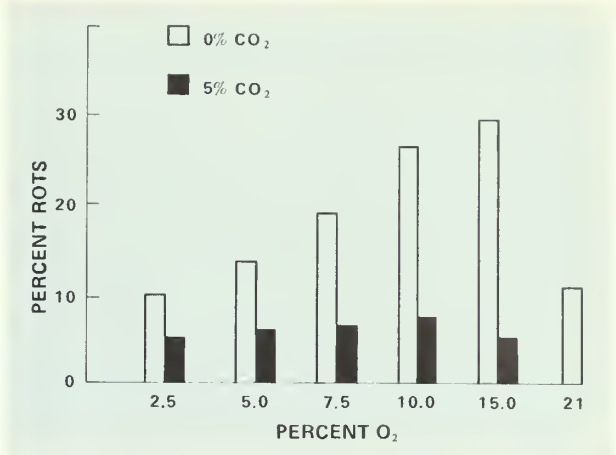


Fig. 2. The percentage of rots in McIntosh apples, caused by Gloeosporium *sp., stored in different O_2 concentrations with and without CO_2.*

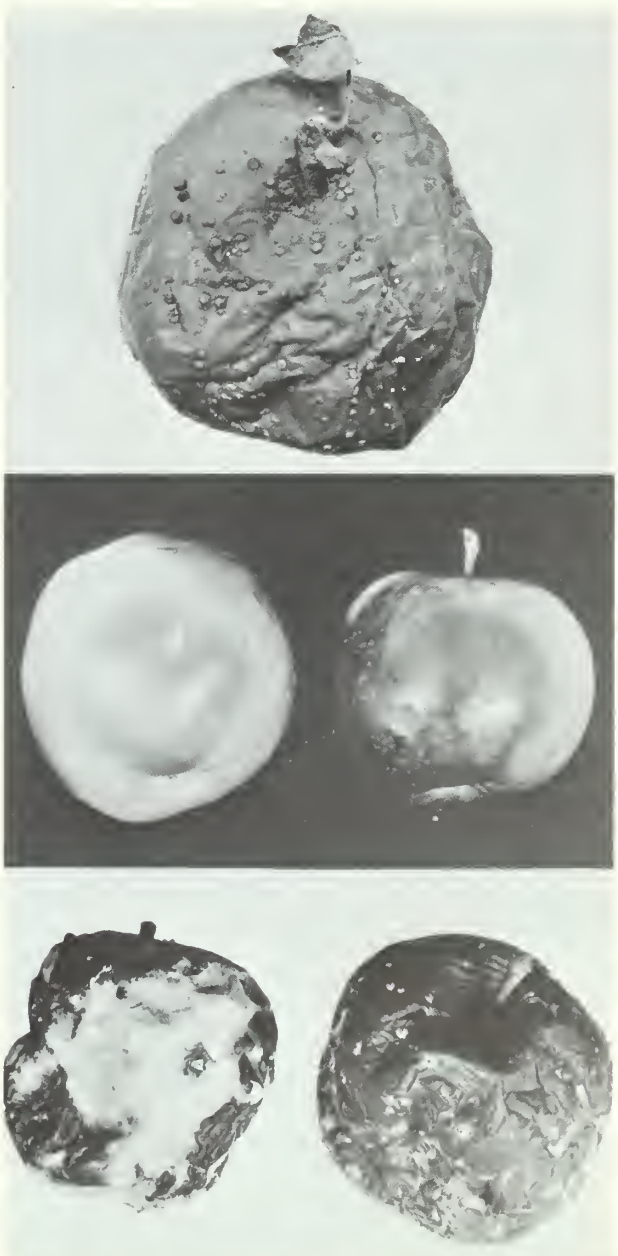


Fig. 3. (Top) Penicillium expansum *rot of McIntosh apple.*

Fig. 4. (Middle) Phytophthora syringae *rot of McIntosh apples.*

Fig. 5. (Bottom) Botrytis cinerea *rot of McIntosh apple.*

Fig. 1. (Left) Spring symptoms of decline in a four year old sour cherry tree with stem pitting (foreground).

Fig. 2. (Middle) Deep pits and grooves in basal trunk (bark removed) of a 12-year old sour cherry. All pits occur at or below union.

Fig. 3. (Right) Basal trunk of a four year old peach tree with stem pitting. Note swelling, and point where a root has broken out (arrow).

PRUNUS STEM PITTING

T. R. DAVIDSON

La picoture des tiges de *Prunus* est une maladie qui pouvant devenir grave attaque tous les fruits à noyaux. La croissance des arbres atteints est arrêtée et, en général, le système radiculaire se réduit considérablement. L'écorce de la partie inférieure du tronc est épaissie et spongieuse. Les nécroses, qui peuvent aller d'une dépression peu marquée à des rainures profondes et des arêtes saillantes, sont le plus prononcées sous l'écorce voisine du point de greffage.

Prunus stem pitting is a disease of stone fruit trees capable of causing thousands of dollars damage in a single year.

Research studies at the CDA Vineland Research Station are concerned with determining if this disease is caused by a virus, and if so, are nematodes or other soil inhabiting agents responsible for the natural spread of the disease in orchards.

The disease, which was first reported as a serious problem in southern Pennsylvania, West Virginia and Maryland in 1967, was discovered in Ontario for the first time in 1968. Surveys taken in 1969 and 1970 showed the disease in sour cherry orchards throughout the Niagara Peninsula; Essex, Kent and Lambton Counties in Southwestern Ontario; near Meaford on the Georgian Bay and near Milton in Halton County.

A few sweet cherry orchards and two peach orchards in the Niagara Peninsula and one plum orchard in Kent County also have infected trees. Surveys for this disease have not yet been conducted in Eastern Ontario.

In the areas of the United States where the disease was first reported as a serious problem, peach trees are the most severely affected, but many sweet and sour cherry, plum and apricot trees have also been killed. In Pennsylvania alone, more than 75,000 peach trees and 30,000 other stone fruit trees have been lost since 1967.

Stem pitting also occurs in peaches in South Carolina, Ohio and Michigan. The disease has also been reported in peaches in Greece and in apricots in Australia.

The symptoms of stem pitting in stone fruits can easily be confused with those resulting from girdling by mice or canker, or from root injury caused by root-rot or poor drainage. Many affected trees have an uneven growth pattern or a general stunting. This may occur before other symptoms develop.

In the spring, infected trees are often very slow to leaf out, and many collapse and die at this time.

The author specializes in stone fruit viruses at the CDA Research Station, Vineland, Ont.

Others leaf normally but begin to decline with the stress of maturing fruit. Fruits color early and leaves become chlorotic, droop and show deficiency symptoms. Some trees die at or shortly after this stress period. Others show decline in the early fall when premature leaf coloration is followed by leaf drop. However, this whole range of symptoms is common to trees that we say "have root problems".

The most characteristic symptoms of prunus stem pitting are found on the lower trunk near the soil line where bark may be much thickened and spongy. The wood beneath this bark is often quite orange and has pits varying from small shallow depressions to deep grooves, furrows and ridges. The pits are usually most numerous near the graft union but may be found some distance above and/or below this point. In some instances severe pitting has been observed five feet above the union and even on lateral branches.

Similarly, pitting has extended down and out onto the roots. In some trees the attachment of the roots to the base of the trunk is weak. Some of these roots break out, leaving socket-like holes. Such trees are much stunted and very poorly anchored. In others there is only slight stunting and the roots are strong.

Stem pitting tends to appear in patches. At Vineland Station we have transmitted the disease from cherry to cherry by budding. Scientists in the United States have had similar results from peach to peach. It would appear, than, that we are concerned with a virus disease that may be transmitted by a soil-borne vector.

In Ontario, sour cherry trees infected with stem pitting are very often also affected by a root-rot. However, the relationship between the root-rot and the stem pitting is not understood. Root-rot has not been associated with peach stem pitting in Ontario. Scientists in the U.S. have not reported the association of root-rot with stem pitting in either cherry or peach trees.

The occurance of root-rot conditions makes the assessment of losses due to stem pitting in sour cherry very difficult. The number of stem pitted trees varies considerably from orchard to orchard; some Ontario growers have only a few infected trees while others have lost nearly one-fifth of their trees over the past five years. The stem pitting/root-rot complex is costing one Ontario grower of 1500 sour cherry trees approximately $3500 a year in production losses and replacement expenses. In at least one peach orchard in Ontario, tree loss due to stem pitting alone has averaged 10 percent over the past four years. Thus, this disease is potentially a very serious one.

Control of prunus stem pitting at present depends upon use of healthy planting stock and the roguing-out of infected trees. Until the means of natural spread is known specific control recommendations can not be given. ■

Fig. 4. Same tree as shown in Fig. 3 with bark removed. Severe pitting extends down onto roots. Note point where a root has broken out leaving socket-like hole (arrow). Union at (a).

Fig. 5. Trunk of a three year old peach tree (bark removed from a 3-foot section) with numerous small pits extending well above the union (a).

BEEF AND PORK PRODUCTS . . . what's ahead in the seventies?

F. E. PAYNE

Une avant-première de ce que sera l'industrie du bœuf et du porc dans les années 70 au Canada.

Meat packing occupies an important segment of the Canadian livestock industry. Over the past 50 years, this group has come a long way, but it is my impression that we will see more major changes in the 70's than have occurred in the past half century. Changing technology, producer participation in the marketing area and the new consumerism, will all combine to keep this rapidly changing industry on its toes.

BEEF SITUATION

The most significant changes in the cattle herds of the nation over the past few years has been in the management and structural areas. These have been: (1) A shift toward more beef cattle and fewer dairy. In the past 20 years, beef breeding cattle numbers have more than doubled, while dairy cattle have been decreased by 25%. (2) A dynamic growth in the feedlot finishing and the decline in calf slaughter.

Rising income levels, population growth and the strong consumer preference for beef, all of which encouraged substantial increases in beef consumption in the last decade, will continue throughout the 70's. Total demand is projected to increase from 2 billion pounds to about 3 billion by 1980. Industry leaders are closely examining all options in order to keep the market basket stocked with high quality beef.

All in all, the future of the beef cattle industry in North America looks bright. Certainly there will be ups and downs, but on the whole it would appear to hold a challenging and rewarding future.

Another factor in the rapid growth in beef production has been the movement of feeder cattle into feedlots and on to slaughter at younger ages. This has not only extended beef output, but has released forage supplies for expanding breeding herds.

More important to the packer than the location

Finishing cattle in a modern feedlot.

The author is Director, CDA Livestock Division, Ottawa. This article is based on a paper Mr. Payne gave earlier this year to the 51st Annual Meeting of the Meat Packers Council of Canada.

of the breeding herds, is where cattle feeding will take place during the 70's.

The expansion in the feedlots regionally has been anything but uniform, but throughout the 60's we saw a rapid growth occurring in the West. The decreasing movement of feeder cattle from West to East which began in 1967 could well continue through the next decade. Thus we see the advent of new processing facilities in the West.

In the near future, we may soon see several forms of integration in beef cattle feeding and processing. As margins become tighter, contractual feeding may become more prevalent. It is questionable if the packer will become too deeply involved in the actual business of feeding cattle as he is basically a processor and merchandiser; he will however, likely extend into contractual arrangements with feedlot operators to guarantee quantity and quality of supply.

Another area where a form of integration could become a reality is in 'specification feeding'. This can be done from packer to feedlot, or direct from chainstore to feedlot. In this type of operation, cattle are fed to specific fat cover, carcass weight and grade.

It is difficult to predict just what form of integration will emerge but it is safe to say that some form will be created within the next few years using the commercial feedlot as the focal point.

BEEF GRADE STANDARDS

It has been estimated that one out of every ten dollars spent for food in the modern food market, is spent on beef. The demand for choice quality beef in this country will extend well into the future. Today's consumer is extremely quality conscious. The modern standard of living tends to place as much or more emphasis on quality than on price. The consumer desires consistent good quality with a minimum of excess fat.

Producers want a grading system that will give them payment for the market value, based on quantity and quality. Meat packers want a system that cuts down on over-fat carcasses and identifies the merchandising value of the meat in that carcass. We, in our role as the Canada Department of Agriculture's administrators of grade standards, want a system that is practical, accurate and rapid.

We are fully cognizant of the fact that there has been considerable confusion and in-fighting, and many 'fixed' positions over the development of a new national grade standard on beef. There is no doubt that no matter what grade standard is finally settled on, it will not satisfy everyone within the industry. Still it must be realized that the consumer is interested in cutting down on excess fat, and she will insist on retaining high eating qualities.

It is clear then that the objective must be to produce and grade out beef carcasses with a maximum of yield of high quality lean, and a minimum of excess fat. Furthermore, it must be of a standard that will meet the packer and retailers' specifications for ageing, shipping and merchandising.

Demonstrating beef grades in a cooler.

We challenge the beef processors to make some compromise in their stand on grade standards, or at least get together with other packers not members of the Meat Packers Council, to provide some uniform thinking on the matter. The same challenge goes out to other segments of the industry that may have taken fixed positions.

The time has come to sit down together and hammer out a sound practical standard that will take us a long step in the right direction. There is no need for anyone to be inflexible. Let's get something working then review it periodically, and amend it as the situation warrants. Nothing is rigid for all time.

PORK PRODUCTION PICTURE

Now what about pork production in the 70's. Our economists tell us it is anticipated that pork production will run parallel with population growth, with little marked change in per capita use. However, I personally have a feeling that in the long run this may prove to be somewhat conservative.

If we continue our advances toward leaner pork, quality control and new product development, we could well see a substantial increase in the demand for pork and pork products. Recent sales of these products have demonstrated the potentials.

No industry-shaking changes occurred in pork production in recent years, but we are on the threshold of major advances which could lead to relatively lower production costs. Large-scale production units are now possible due to good successes in disease control. Research is continually being applied to produce better genetic lines. Some of the consumer's ill-founded myths about pork are being dispelled—they now recognize pork as a good source of protein

for the family diet. Furthermore, producers are better organized now and they are spending time and effort on the promotion of the product.

All of this should create a fairly optimistic outlook for the future position of pork in relationship with other meats in the 70's.

The Meat Packers Council of Canada, working jointly with the National Swine Council, were instrumental in formulating the most sophisticated hog grading system of any country in the world. This was an excellent example of how two groups working closely together could achieve a goal that was mutually acceptable.

The indexing system of Hog Carcass Valuation had a built-in incentive for quality improvement and as a result Hog Quality Premium could be phased out. The phasing out process which began on April 1, 1969, was terminated on December 31, 1970.

However, this has apparently created another problem—the purchasing of hogs on a live basis; which could have serious side effects. While there is nothing illegal about this procedure, and it was anticipated that some of the small plant owners who were fighting for their share of the total hog production might react, we did not expect similar action from some of the plants from which initial live purchases are now being reported.

What will be the side effects? First, consider the Hog Carcass Valuation System which was designed as a means whereby hog producers would receive payment for the value of lean trimmed cuts, as indicated by a yield index. Producers received a grading certificate which they could apply in their breeding, feeding and management program toward hog quality improvement. But producers of hogs that are sold on a live basis will not receive this certificate, and therefore will have no yardstick by which to measure hog quality—let alone make improvement.

Also, consider the producer of poor hogs, that is hogs indexing below 100, who will be anxious to sell on a live basis (with perhaps a guaranteed grade thrown in). These are the producers that the system was designed to help. But why should they make any effort to improve hog quality if they can sell on a live basis?

If the incidence of live buying grows, it will be increasingly difficult to obtain accurate statistical data on origin of hogs, i.e. province and county, or crop district, or origin of hog produced in any area in Canada. Processors ask that this information be made available so that the location of large concentrations of hogs may be known. Any disruption of the present system will have a detrimental effect on the accuracy of any origin report compiled by Markets Information for producer and industry use.

Finally, a deficiency payment if even required, would necessitate substantiating documents in the form of grade certificates in a producer's claim for payment. Hogs sold on a live basis will not be covered by a grade certificate, and the producers of these hogs would have no substantiating document on which to claim deficiency payments.

Grader measuring hog backfat prior to hog carcass indexing.

The side-effects of live buying of hogs could be detrimental.

BETTER MARKETING NEEDED

Everyone has problems, and the livestock business in the 70's will have their share. Problems look different from different vantage points.

The meat packing industry will continue to carry a very expensive overhead. Many of the old practices die hard, and we will undoubtedly see some plants closing their doors in the 70's and new ones opening up.

In the past we have been too prone to do our market thinking in reverse. We must start with the consumer and consider her likes and dislikes, then work back to the primary producer. Too frequently the attitude has been that the consumer should accept what the producer or processor chose to offer.

Our greatest potential is in greater attention to marketing. Not in the narrow sense of just pricing, which is not marketing at all. Marketing is more than that—it is market development, market analysis, innovative marketing—to convert the potential market into reality, developing new and better procedures in moving, processing and producing the raw material through to the final consumer in the form, time and place she wants it. There are many challenges facing Canadian agriculture in the 70's, but the greatest is in re-orientating our thinking along markets and marketing lines, and adapting our plans to the market. Our agriculture must become market oriented to survive and to grow.

In the future, meat packers will, from necessity, merchandize more packaged meat to maintain more profit margins. The meat marketing structure will revolutionize, with quality and percentage of fat becoming relatively more important than price per pound, and the beef once moving from feeder to

A wide range of meat products are available to the consumer.

central market, then to packer, to retailer and finally to consumer, may follow a much more direct route.

Prepackaging would certainly be a great step forward if it could be worked out. The question, however, arises as to what form the supermarkets should take their supplies of red meat, particularly beef. It is a matter of vital concern to the retail operators and to those in the beef business.

Probably for some time in the 70's, beef will continue to be shipped from packers to retailers in both carcass form and primal cuts, and others with various types and forms of protective wrapping. The various methods used will depend on the retailer's preference and facilities.

Fabrication of product may be a profit opportunity for the future. It may well be that if the packers themselves do not pick up the challenge and move into this area, that it will be taken over by an entire new group of entrepreneurs.

CONSUMER MORE KNOWLEDGEABLE

Consumers are becoming much more knowledgeable and, at times, vocal. The packers and retailers must take a positive attitude toward a reasonable and fair solution of the consumers' demands. Your attitude must be slanted toward what is right and best for the consumer, who is your final customer and is the sole reason for your very existence.

You should not oppose valid consumer protection practices. On the other hand, you should not let practically unsound and costly solutions be adopted without taking issue.

We must anticipate and expect various types of legislation in the consumer protection field. Your job will be to see that such legislation sets out a practical and workable solution which will be of value and usable by the consumer on a continuing basis.

Because meat purchasing and meat preparation are so much a part of the every day decision for Canadian women, the industry must have the consumer's complete confidence in the product it delivers to the marketplace. The industry concern itself with Mrs. Consumer's genuine apprehensions, and she in turn must be brought to understand the industry's limitations.

The 'new consumer' does exist, and she will continue to pose a challenge throughout the 70's to every meat packer in this country. Many consumers have shown a real demand for adequate product information. The consumer must be offered information, *not* propaganda. Meat packers and others in the consumer service can ignore them only at their peril.

Il would appear very likely that the 70's will witness a new penetration of the manufactured meat market by the so-called synthetic substitutes.

Although use ot vegetable protein will undoubtedly continue to increase because of its lowering costs, consistent quality, and longer storage life without refrigeration, it is unlikely that synthetics will seriously reduce the aggregate demand for meat, particularly table cuts, in the next decade.

Substitute use will certainly continue to grow. It is felt that substitutes will first make important inroads by being used as extenders in ground comminuted products. Because a much larger proportion of beef is consumed in this form than in the case of pork, it might be assumed that beef would be more vulnerable to the substitutes than would pork. But the answer is not at all clear at this point of time—it is much too early to draw any firm conclusions.

There is little reason to believe that the vegetable protein product will ever replace meats. Progress in this area will be relatively slow through the 70's and confined mainly to additives to meat products. However, if the meat battle of the market place slows down to allow inefficiencies in any form, the synthetics will be waiting in the wings to move in.

MEETING THE FUTURE'S CHALLENGE

The world is passing through a period of unsettlement due to automation, computerization, population increase, pollution of air, water and land.

We are confused by a multitude of things so that the chances seem dim of us surviving a combination of complexes, women's liberation, sex and traffic.

We tend to be afraid of innovations and think up many objections to counter every suggestion for advancement. The present is again a period of social change. In 1971 and every succeeding year, we should be called upon to face novel situations which have no parallel in our past.

We need not only eyes and ears to learn what is going on, but minds to understand what the effects will be, and strength to resist where principles tell us to, and the sensitivity to give in where the change is not harmful. If we are convinced that the present is, on the whole, better than the past, and that the future may be better still if we make the effort, we may make changes throughout the 70's with confidence. ■

EARLY GRAPES FOR WINE how they perform in B.C.'s coastal area

H. ANDISON

Des chercheurs étudient les qualités des variétés de raisins hâtifs en vue de la fabrication du vin. Ces raisins poussent dans les vignobles côtiers de la Colombie-Britannique.

During the past five years at the CDA Research Station in Saanichton, we have been testing new and untried early grape varieties, mainly to determine their potential for wine.

We have evaluated the many advantages and disadvantages under the growing conditions found in the coastal area of British Columbia where the number of degree days above 50°F vary from a low of 1350 to a high of 2674.

In the severe winter of 1968-69 in the Okanagan valley, when temperatures dropped as low as −35°F, some of the vineyards were seriously damaged. Since then commercial wine companies have become more interested in the growing of wine varieties on coastal B.C. At present, the B.C. Department of Agriculture is recommending only seven varieties for planting in the Okanagan valley: Baco No. 1, Delaware, Foch, Himrod, Seibel 13053, Seibel 9549 and Riesling.

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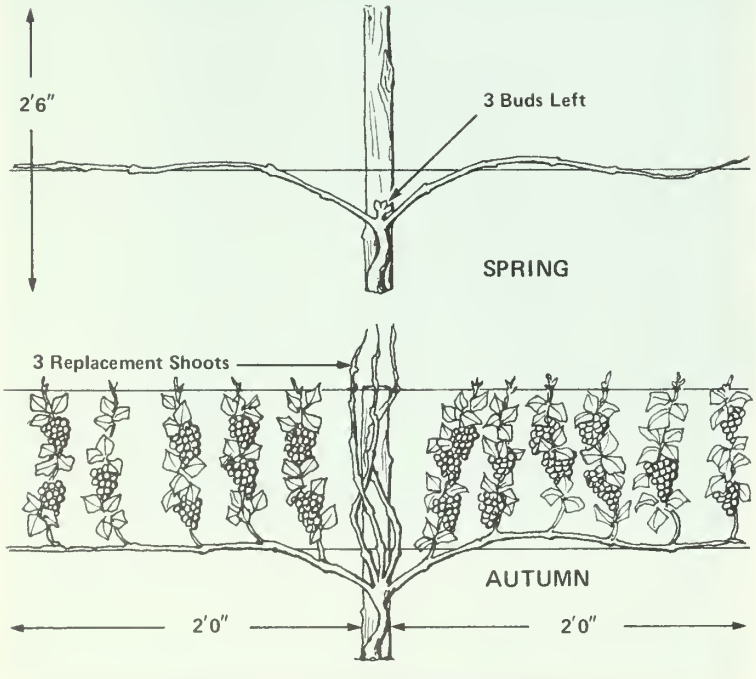
The Research Station vineyard was established in 1965. This was the year that the Post Entry Quarantine Station was established at Saanichton in cooperation with the CDA Plant Protection Division. Since then all grape varieties imported into Canada must have been indexed and certified free from disease at Saanichton before being released for planting. The grape varieties for the initial planting in our plots were obtained from several sources; the main ones were: Viticulture Research Station, Oxted, Surrey, England; CDA Research Station Summerland; Horticultural Research Institute, Ontario Department of Agriculture, Vineland, Ontario.

The growth of the plants in our vineyard has been excellent every year. The very severe freeze that occurred in December 1968 and January 1969 when the temperature dropped to an all-time low of −7°F (−14°C), did not appear to affect any of early varieties. The significant productive year have been since 1967 so this report presents yield data for three harvest seasons.

Although heat units in day degrees above 50°F (10°C) was considered to be marginal for grapes, at least 15 early varieties produced from 15 to 20 percent soluble solids (sugar). The results from five promising wine varieties grown by the Kniffen system are shown in the table.

Other varieties starting to produce fruit that look promising are: Schuyler, Seibel 13053, New York Muscat, Vineland 37034, Siegerrebe, Seyval and Precoce de Malingre.

The three commercial wineries in the coastal area of B.C., Andres Wines Ltd., Port Moody B.C., Growers Wine Co. Ltd. Victoria, and Villa Wines Ltd., New Westminster, are particularly interested in Aurora, Foch, Himrod, Seibel 9549, Seyval, Schuyler, New York Muscat and Vineland 37034. Most of these varieties are no longer recommended for planting in the Okanagan Valley because they are not winter hardy. As a result of our tests, these wineries are now planting the above varieties in nurseries and in trial plantings in the coastal area of B.C.



THE DWARF GUYOT SYSTEM

EVALUATION OF EARLY GRAPE VARIETIES AT SAANICHTON

Cropping year	1967	1968	1969	Average		
Day degrees above 50°F	1847	1526	2674		Soluble	
Variety				Yield	Solids	Acid
	lb	lb	lb	lb	%	gm/100 ml
S. 9549	16	32	16	21.3	16.1	1.3
Foch	[1]	25	15	20.0	20.8	1.0
Aurora	13	19	20	17.3	18.5	1.1
Diamond	8	21	9	13.0	18.0	0.6
Himrod	6	16	5	9.0	18.0	0.5

[1]Starlings and robins destroyed the crop

Tests have included methods of training grape vines. The low wire or Guyot system of training has produced the best yields and sugar content from varieties grown this way.

In addition to the production phase of this study, information was obtained on what the industry required in the way of a quality wine grape. We had the excellent cooperation of the three wineries mentioned above. Harvested grapes from several varieties were shipped to these wineries to evaluate their relative merits for wine.

In general the results of our evaluations have been encouraging. There are many favorable signs pointing towards increased commercial production of several of these early varieties, especially the new hybrids, for wine.

The best yields and sugar content have been obtained when the varieties are grown on the low wire or Guyot system of training (see photo). Using this method the canes are grown 2 feet long and trained on wires about a foot above the soil so the fruit is less than 2 ft. from the soil level. In this way an increase in the amount of heat radiation is utilized from the soil as compared to the Kniffin or high wire system.

A brief evaluation and description of each variety follows (Those marked with an asterisk (*) are also good dessert or table grapes):

**Aurora* (Seibel 5279). A white French hybrid well known for its wine quality. Berries and clusters small, medium productive. Mildew resistant but not hardy, and susceptible to fruit rot at harvest time.

Diamond. An old white Labrusca (American) variety. Tight shouldered medium size bunches, productive. Mildew resistant and fairly hardy.

Foch. Early ripening blue hybrid with high sugar content. Berries and bunches small. Productive, mildew resistant and hardy. Wine (of Burgundy character) tests very favorable. Bird damage serious.

**Himrod.* High quality, white, seedless, American hybrid. Berries medium size, bunches long and loose, subject to shelling. Yield is low and variety fairly susceptible to mildew.

**New York Muscat.* Reddish-blue Ameridan hybrid of high muscat quality. Medium size berries and loose bunches. Moderately productive and mildew resistant.

**Precoce de Malingre.* Early ripening white, high quality wine of Chablis or Loire type. Berries and clusters small. Productive and mildew resistant. Grown commercially in south of England.

Seibel 9549. Blue-black, French hybrid with very high acid content. Berries and clusters medium size. Productive, mildew resistant and hardy.

Seibel 13053. Early blue-black French hybrid with medium size loose bunches. Vigorous, productive, mildew resistant and hardy. Wine of Beaujolais character. Birds are a problem.

**Seyval.* White European hybrid with medium size, tight bunches. Productive, hardiness average, mildew resistant. Wine quality good.

**Schuyler.* Blue-black American hybrid, with large well-filled bunches. Productive, fair quality, slightly susceptible to mildew, not hardy.

**Siegerrebe.* Earliest variety we have grown. A German variety with dark golden berries of medium size, in tight clusters, muscat flavor. Vigorous, productive, mildew resistant. No data on winter hardiness. Grown commercially in south of England.

**Vineland 37034.* Early, white Canadian hybrid, with medium size compact bunches. Productive, slightly susceptible to mildew, hardiness not determined. Wineries very interested.

All of the varieties mentioned have now been indexed as free from known diseases and pests, at the Post Entry Quarantine Station, Canada Department of Agriculture, Research Station, Saanichton. They are available, free of charge, in limited quantities as non-rooted cuttings during February and March.

Results of 1970 tests conducted have recently been received from the wineries. The companies found several promising varieties with Vineland 37034, Schuyler, New York Muscat, Aurora and Foch topping the list of favorites. One of the wineries has already planted a large acreage, including the above varieties, at Duncan, 30 miles north of Victoria.

This information is of international interest, for we are one of the first stations anywhere to have grape stock free from known virus. The grape stock is available to growers and nurserymen throughout the world. ■

CANADA AGRICULTURE