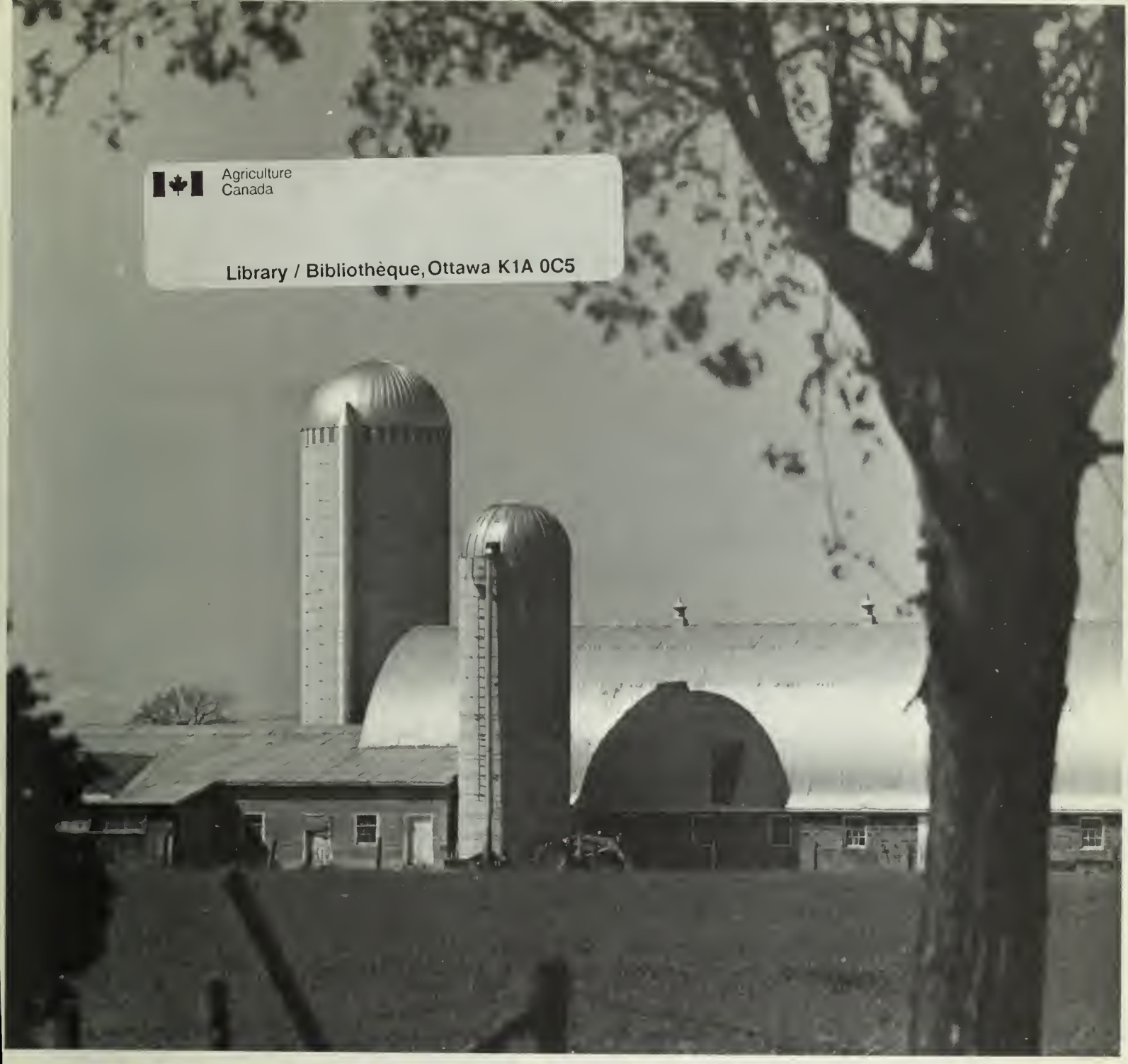


CANADA AGRICULTURE

UMMER '70 / ÉTÉ '70

CANADA AGRICULTURE

VOLUME 15 SUMMER 1970 NO. 3
VOLUME 15 ÉTÉ 1970 N° 3

JOURNAL OF THE CANADA DEPARTMENT OF AGRICULTURE—OTTAWA
REVUE DU MINISTÈRE DE L'AGRICULTURE DU CANADA—OTTAWA

MINISTER, HON. H. A. OLSON, MINISTRE DEPUTY MINISTER, S. B. WILLIAMS, SOUS-MINISTRE

CANADA AGRICULTURE is published quarterly to inform extension workers and agribusinessmen of developments in research and other federal agricultural responsibilities.

Any article may be reproduced without special permission provided the source is given credit. If excerpts only are to be used, authors' permission should be obtained.

Reprinted articles must not be associated with advertising material. The use of trade names published in this journal implies no endorsement of the products named nor any criticism of similar products not mentioned.

Contributors may submit articles in either English or French to the Secretary, Editorial Board, Information Division, Canada Department of Agriculture, Ottawa.

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.

La reproduction des articles est permise en indiquant l'origine. Pour reproduire des passages d'un article, l'autorisation de l'auteur est nécessaire.

Les articles reproduits ne doivent pas servir à des fins de réclame. La mention de marques de fabrique ne signifie pas que la revue garantit ces produits ni qu'elle déconseille d'autres produits non mentionnés.

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.

LOOKING AHEAD WITH THE DAIRY INDUSTRY AND CANADIAN AGRICULTURE

The author discusses four problem areas: maintaining a reasonable balance of production and market demand; achievement of effective marketing; satisfying consumer requirements; and international problems such as protection and subsidy which interfere with trade in agricultural products.

W. E. JARVIS

In looking ahead with the dairy industry and with agriculture generally, perhaps our toughest problem is—How do we maintain a reasonable balance of supply of our farm products with the demand for these same products? There is no question that we have the ability to produce more than can be marketed through commercial markets; and that statement can be applied to almost any farm product produced in Canada today, with the few exceptions, such as tender crops, peaches, etc. We have in this country

Mr. Jarvis is Assistant Deputy Minister (Production and Marketing), Canada Dept. of Agriculture, Ottawa, Ont. This article is based on a paper he gave recently to the Manitoba Dairy Association in Winnipeg, Man.

PERSPECTIVES DE L'INDUSTRIE LAITIERE ET DE L'AGRICULTURE CANADIENNE

L'auteur traite les problèmes de quatre domaines: le maintien de l'équilibre entre la production et la demande des marchés; la recherche d'une commercialisation efficace; la satisfaction des besoins des consommateurs et les problèmes internationaux qui viennent perturber les échanges de produits agricoles.

W. E. JARVIS

Peut-être que le problème le plus difficile à résoudre lorsque l'on se tourne vers l'avenir de l'industrie laitière et de l'agriculture en général est de maintenir un équilibre raisonnable entre l'offre des produits de la ferme et la demande pour ces mêmes produits. Il n'y a pas de doute que nous pouvons produire plus que nous pouvons vendre sur les marchés commerciaux; ceci est vrai pour presque tous les produits de la ferme au Canada avec quelques exceptions comme, par exemple, les fruits tendres, les pêches, etc. Dans notre pays nous avons une économie de marché; théoriquement, ceci signifie que les prix des denrées sont fixés par le marché. Jusqu'ici et par tradition, les cultivateurs ont eu la liberté de produire ce qu'ils voulaient, quand ils voulaient et à la quantité qu'ils le désiraient. Cette liberté leur est chère.

Les cultivateurs seront peut-être amenés à remettre en question cette liberté au cours de la prochaine décennie afin de s'assurer un revenu plus stable et plus indépendant. Ayant plus de richesses mises en jeu, une plus grande planification est nécessaire. Pendant de nombreuses années, les producteurs de lait nature ont opéré suivant un programme efficace de gestion de l'offre. Ne devenaient nouveaux producteurs que ceux qui obtenaient à la fois un contrat et un contingent. Chaque producteur s'engageait à fournir continuellement au long de l'année la quantité prévue au contrat.

M. Jarvis est sous-ministre adjoint (Production et Commercialisation) au ministère de l'Agriculture du Canada, Ottawa. Le présent article s'appuie sur une causerie qu'il a présentée récemment au Manitoba Dairy Association à Winnipeg (Man.).

a market economy; basically, the market sets the prices for our commodities. Farmers have traditionally enjoyed, and indeed cherished, the freedom to produce what, when and as much as they chose.

Perhaps farmers will re-examine this freedom in the next decade in an endeavor to achieve a more stable and dependable income. With greater commitment of resources, more planning is required.

Fluid milk producers have, of course, for years operated an effective supply management program. new producers only entered the enterprise when they obtained a contract and a quota. Each producer undertook a commitment to produce continuously at an agreed level.

Perhaps it is not by accident that our fluid milk industry is one of our most efficient, as well as stable farming enterprises. Farmers have been able to plan, invest in facilities, and cattle, and improvements to their business, in the knowledge that they had a dependable market.

So one of the tough questions for several areas of the farming industry is that of how to maintain a reasonable balance of production and market demand.

MORE EFFECTIVE MARKETING NEEDED

The second problem, and closely related, is—How do we achieve more effective marketing of our farm products? There is no question that we have devoted greater effort to improvement in production of our products than we have to the marketing of them. Marketing boards or commissions may be part of the answer for some commodities. We have over 120 provincial marketing boards in Canada now, and the Federal Government is introducing legislation which will facilitate the establishment of *National* marketing agencies. In addition to achieving greater order in the marketing of our products, we need to be worried about *merchandising* them.

How can we assure that we do take advantage of market opportunities for our products both at home and abroad?

How will we live in the consumer world of tomorrow? We are all consumers. But a smaller and smaller proportion of our people are directly involved in the farming industry.

Mrs. Consumer has been a main beneficiary of technological advance and efficiency in the agricultural industry. In 1950, 25 per cent of our take-home pay was directed to food; at the present, less than 19 per cent is so directed.

In 1946, an hour's labor by an industrial worker would buy 1.7 pounds of butter; in 1967, it bought 2.8 pounds. In 1946, an hour bought 21 pounds of potatoes; in 1967, 43 pounds. In 1946, one hour bought 1.4 dozen eggs, and, in 1967, 4.4 dozen.

According to an article entitled "The New Decade" which appeared in a recent edition of *Changing*

Ce n'est peut-être pas un fait du hasard si notre industrie du lait nature est l'une des plus efficace et des plus stable des activités agricoles. Parce qu'ils étaient assurés de la constance du marché, les producteurs ont été capables de planifier, d'investir dans des équipements et des animaux et d'améliorer leur entreprise.

Ainsi le problème le plus ardu dans plusieurs domaines de l'industrie agicole est de savoir comment maintenir un équilibre raisonnable entre la production et la demande du marché.

LE BESOIN D'UNE COMMERCIALISATION PLUS EFFICACE

Le second problème qui découle du premier consiste à savoir comment on peut rendre plus efficace la commercialisation des produits de la ferme. Il ne fait pas de doute que nous avons fait beaucoup plus d'efforts pour améliorer la production de nos produits que nous n'en avons fait pour leur commercialisation. Pour certaines denrées, la solution peut être donnée en partie par des offices de commercialisation ou des commissions. Nous avons déjà 120 offices de commercialisation provinciaux au Canada et le gouvernement fédéral, par une nouvelle législation, va permettre l'établissement d'agences de commercialisation *nationales*. En plus de développer l'organisation de la commercialisation de nos denrées, nous devons aussi nous préoccuper de leur *mise en marché*.

Comment pouvons-nous nous assurer que nous tirerons profit du marché pour nos produits aussi bien au pays qu'à l'étranger?

Comment vivrons-nous demain dans un monde de consommation? Nous sommes tous des consommateurs, mais une proportion de plus en plus petite de la population est directement impliquée dans l'industrie agricole.

C'est la maîtresse de maison qui a le plus bénéficié de l'avance de la technologie et de l'efficacité de l'industrie agricole. En 1950, 25% du chèque de paye était employé pour la nourriture. Maintenant moins de 19% remplit le même usage.

En 1946 un ouvrier industriel pouvait acheter avec son salaire horaire 1.7 livre de beurre; en 1968, il peut en acheter 2.8 livres. En 1946, une heure de travail permettait d'acheter 21 livres de pommes de terre; en 1967, 43 livres. En 1946, cette heure de travail permettait d'acheter 1.4 douzaine d'œufs et en 1967, 4.4 douzaines.

Dans une récente édition de la revue *Changing Time* un article intitulé «The New Decade»prédisait qu'en Amérique du nord au cours de la prochaine décennie on assisterait aux changements suivants:

1. le revenue réel, c'est-à-dire la somme qui reste après la déduction des taxes, s'élèvera de plus de 50%;
2. que les femmes mariées occuperont 25% plus d'emplois;

Times, it predicted for North America during the next decade:

1. that real disposable income (take-home pay after taxes) will jump by well over 50 per cent;
2. that the number of working wives (employed outside the home) will increase by 25 per cent;
3. that by 1980 two-thirds of the entire adult population will consist of people who grew up in the prosperous post-war period;
4. that whereas, at the end of the 1950's, 10 per cent of all income was spent on luxuries, by 1980 that amount will be an estimated 30 per cent of family income; and
5. that expenditures on food as a proportion of family income will decline still further than it has to date.

In my view, this spells challenge and opportunity for the food industry to participate in new food markets, new food products and new eating patterns. Certainly the consumer will have many choices, many alternatives. We will have to be on our toes. No industry will have greater opportunity to participate than the dairy industry, with its range of products from staples to confections. Imaginative product development, design and merchandising will, however, all be involved.

And you will have to compete against those who would lead you to believe that they can offer the consumer an acceptable substitute product which is similar to but not of dairy origin.

How do we solve some of the international problems which interfere with trade in agricultural products?

Canada is very dependent on trade. Our agriculture is very dependent on export trade with about one-third of our production being exported. As a country we have been working toward freer and freer trade. However, very high levels of subsidization of production in some other countries have led them to disruptive trading practices, either by protecting their own market through trade barriers or by disrupting markets in other countries to which we normally export.

It so happens that Canada's dairy industry receives more protection against imports than most areas of agriculture, but the world dairy industry is suffering from heavy surpluses and very low prices.

We are working and must work at solving these international problems at every opportunity.

And finally, all of these elements of the challenge ahead of us must be related back to what is perhaps our most important objective—that of providing our farmers with the opportunity to have an income that is comparable to that enjoyed by people in other sectors of the economy for similar investment of resources and effort.

This can be achieved, is being achieved by many now, but it will be a continuing struggle in a highly organized economy. ■

3. en 1980 les deux tiers de la population adulte seront constitués de gens qui auront grandi dans la période prospère de l'après guerre;
4. à la fin des années 50, alors que 10% seulement des revenus étaient dépensés en superflu; en 1980, ce montant atteindrait 30% du revenu de la famille et;
5. que les dépenses alimentaires en proportion du revenu de la famille s'abaisseront encore par rapport à ce qu'ils sont en ce moment.

Pour ma part, ces prévisions indiquent, à la fois, un défi et une chance pour l'industrie de l'alimentation à participer à de nouveaux marchés, à créer de nouveaux produits et par le fait même, une nouvelle forme d'alimentation. Le consommateur aura de nombreux choix, de nombreuses possibilités. Il nous faudra être aux aguets. Aucune industrie plus que l'industrie laitière dont la gamme des produits va de l'essentiel au superflu n'aura plus de chance de participation. Les efforts d'imagination, de présentation et de mise en marché des produits continueront cependant d'être essentiels. Il faudra aussi concurrencer ceux qui vont chercher à faire croire qu'ils peuvent offrir aux consommateurs des substituts acceptables des produits du lait bien que ceux-ci ne soient pas d'origine laitière.

Comment pourrons-nous résoudre quelques-uns des problèmes internationaux qui contrecarrent les échanges des produits de l'agriculture? Notre pays dépend beaucoup des exportations. Environ un tiers de notre production agricole est exportée. Notre agriculture est donc très dépendante des échanges internationaux. En tant que nation, nous devons essayer de rendre le commerce de plus en plus libre. Cependant, une très forte subvention à la production dans certains pays ont conduit à des pratiques d'échanges désastreuses, soit en protégeant leur propre marché par des barrières douanières ou en disloquant les marchés des pays dans lesquels nous exportons habituellement.

Ainsi l'industrie laitière du Canada reçoit plus de protection contre les importations que tous les autres domaines de l'agriculture, mais l'industrie laitière du monde entier souffre de grands surplus et de très bas prix.

Nous travaillons à résoudre ces problèmes internationaux et nous devrons travailler encore, chaque fois que cela sera possible.

Finalement tous ces éléments de défi qui nous attendent doivent être mis en relation avec ce qui, peut-être, est le plus important de nos objectifs, c'est-à-dire d'offrir aux exploitants agricoles la possibilité d'avoir un revenu qui soit comparable à celui des travailleurs des autres secteurs de l'économie pour les mêmes investissements des richesses et de l'effort.

Ceci est possible, beaucoup déjà le font. Cela implique, toutefois, une bataille continuelle dans une économie hautement organisée. ■

FEEDLOT STARTER RATIONS FOR BEEF CATTLE

R. HIRONAKA

Les rations de début pour bovins en enclos mises au point à la Station de recherches de Lethbridge permettent de passer rapidement et sans danger au plein régime d'engraissement. Le nouveau plan comporte un accroissement soutenu de la proportion des principes d'énergie métabolisable de la ration. La transition du foin à une ration d'engraissement forte en grain a été accomplie en 8 jours comparativement à 28 jours dans les plans utilisés antérieurement.

Cattle have the capability of adapting to rations composed entirely or predominantly of hay or to rations that are predominantly or entirely grain. In practice, young cattle destined for slaughter generally receive rations composed mostly of hay. After they reach a weight of 600 pounds or more, they are fed rations that are predominantly grain. This change in kind of ration is a critical one to the cattle. If grain consumption is increased too rapidly, they will suffer from digestive upsets, a common cause of death in feedlots.

At the CDA Research Station, Lethbridge, we have developed rations and programs that allow cattle to make the transition from high hay to high grain finishing rations safely in 8 days. This compares with about 4 weeks needed under the system previously used of gradually increasing the amount of grain offered. In addition, because the new rations are

A comparison between, left: The amount of hay plus starter concentrate needed to get cattle on feed in eight days and, right: The amount of completely pelleted starter needed to get cattle on full feed in eight days.

Dr. Hironaka specializes in animal nutrition at the CDA Research Station, Lethbridge, Alta.

self-fed, much less labor is required than under the old system of controlled feeding.

The first of our starter rations consisted of 25 per cent dried molasses beet pulp or dried brewer's grains, 20 per cent ground alfalfa hay, 25 per cent oats, 21.5 per cent barley, 5 per cent molasses, and 3.5 per cent minerals and vitamins. Cattle were fed this ration plus hay free choice for 2 days, then mixtures of the starter ration and increasing proportions of finishing ration so that from the 9th day the finishing ration and hay were fed. The amount of hay was gradually reduced to 1 or 2 pounds per head by about the 15th day. This program or one similar to it has been widely used by the feeding industry.

We found that with this first starter ration the amount of feed consumed on the 3rd and 4th days was markedly reduced and that the cattle had a mild diarrhea. Cattle fed hay with increasing proportions of grain, starting at 70 per cent hay and 30 per cent grain, with the amount of grain increasing 10 per cent and that of hay decreasing 10 per cent every second day until the ration contained 80 per cent grain, showed similar signs of reduced feed intake and of mild diarrhea from the 6th to the 10th days. This system had the disadvantage of requiring daily weighing of concentrate and hay to maintain the desired ratio. And, in spite of the extra labor involved, the average digestible energy intake was about 15 per cent lower than that of the system using the starter ration.

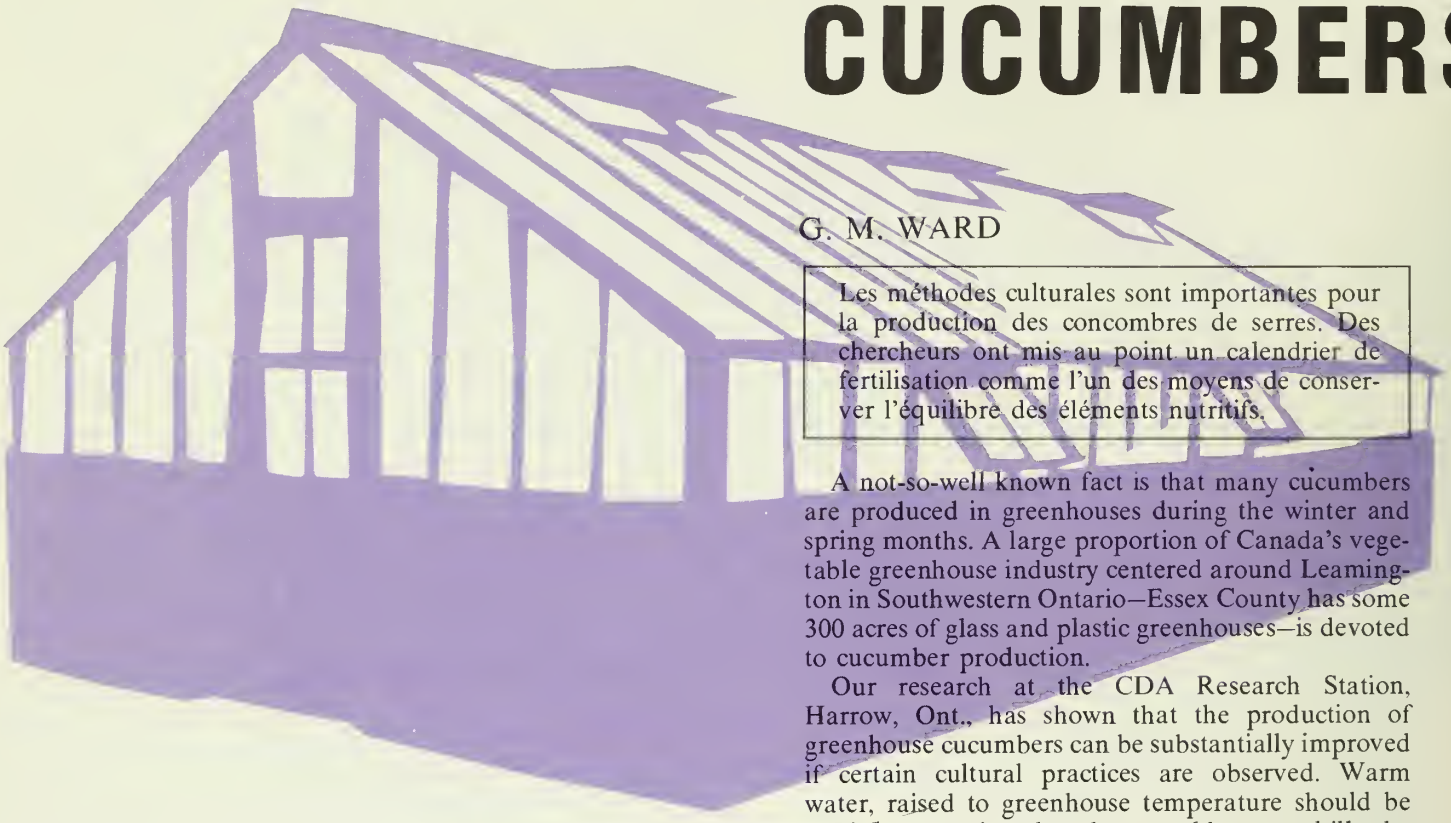
The first starter rations formulated required that long hay be fed as part of the daily ration. In feedlots where this starter ration was fed in a self-feeder, extra space was required to feed long hay for a short period. With this in mind we devised a starter ration that incorporated hammered hay into the pellets thus eliminating the need for extra feed space. The ration consists of 12.5 per cent dried molasses beet pulp, 5 per cent dried brewer's grain, 50 per cent hay, 25 per cent oats, 4.5 per cent molasses, and 3 per cent minerals and vitamins. Cattle fed this starter ration made a transition from all roughage to a pelleted finishing ration containing 15 per cent hay and 85 per cent grains and concentrates in 8 days. The transition was done by self-feeding the starter ration for 2 days, then mixtures of 25:75, 50:50, and 75:25 starter: finishing ration, each for 2 days. From the 9th day, only the finishing ration was fed. As with the first starter rations, feed intake dropped markedly on the 3rd and 4th days. However, this temporary digestive disturbance was not considered serious.

Our studies to date indicate that the digestible energy concentration of the ration should be increased gradually when starting cattle on feed. The starter rations and programs that we have developed at the Lethbridge Research Station accomplish this. Consequently, cattle can be put on full feed quickly and safely with a minimum of labor. ■

'OPERATION LIFT'

The article on 'Operation Lift' in CANADA AGRICULTURE (Spring '70 edition) was based on the initial release issued under the authority of the Hon. H. A. Olson, Minister of Agriculture, and the Hon. O. E. Lang, Minister Without Portfolio Responsible for the Canadian Wheat Board. Since that initial release, further 'program details' have been announced. Readers wishing to keep abreast of these program details should read 'OPERATION LIFT' Bulletins, Nos. 2 and 3, obtainable from: 'OPERATION LIFT', 500 Financial Building, Regina, Sask., Phone . . . 522-2637.

GREENHOUSE CUCUMBERS



SCHEDULED FEEDING GUIDE KEEPS NUTRIENTS IN BALANCE

G. M. WARD

Les méthodes culturales sont importantes pour la production des concombres de serres. Des chercheurs ont mis au point un calendrier de fertilisation comme l'un des moyens de conserver l'équilibre des éléments nutritifs.

A not-so-well known fact is that many cucumbers are produced in greenhouses during the winter and spring months. A large proportion of Canada's vegetable greenhouse industry centered around Leamington in Southwestern Ontario—Essex County has some 300 acres of glass and plastic greenhouses—is devoted to cucumber production.

Our research at the CDA Research Station, Harrow, Ont., has shown that the production of greenhouse cucumbers can be substantially improved if certain cultural practices are observed. Warm water, raised to greenhouse temperature should be used for watering the plants; cold water chills the roots, retards growth, and eventually reduces the yield of fruit. To permit more light to reach the plants and thus improve growth and fruit production, the vegetative growth is severely pruned so that a canopy is not allowed to develop above the supporting wires. Blossom thinning always results in an increase in both the number and size of marketable fruit. Sometimes an increase in the number of fruit produced is obtained by allowing two main stems to grow on a plant.

The cucumber is a heavy feeding plant. In our experiments at Harrow, we have shown that during an entire cropping period, from January 15 to July 15, a test crop planted at the rate of 8840 plants per acre produced 30 fruit per plant and took nutrients from the soil at the following amounts per acre: nitrogen 364 pounds, phosphorus 82, potassium 490, calcium 212, magnesium 51. Since it is necessary to feed this crop continuously through the growing period, we developed a feeding schedule for the weekly application of fertilizer. This schedule is available for the guidance of growers.

We based our fertilizer schedule (see accompanying table) on a moderate level of soil fertility before

Dr. Ward is a chemist with the CDA Research Station, Harrow, Ont.

Left—Some results of the cucumber breeding program at Harrow.

Right—Growing cucumbers on straw bale culture—an artificial medium.

planting and no precrop application of fertilizer. We have found that growers often apply 1000 to 2000 pounds of superphosphate per acre or a mixture such as 0-20-20 to the soil before transplanting. Our research has shown that this is not necessary, if continuous fertilization is practiced during crop growth. However, it can do little harm if growers adjust the schedule accordingly, but much of the phosphate may be fixed by the soil before the plants can use it. On the other hand, we know that many growers also use manure as a precrop treatment or as a mulch. This may make it difficult to control the nutrition of the growing crop because there is always the danger of young plants being burned with ammonia from overly fresh manure.

Suppose plant symptoms in the previous crop or the results of soil or tissue tests show that magnesium is lacking. What then? We found by applying magnesium sulfate to the soil at the rate of 250 pounds per acre before planting the next crop that the disorder can be controlled. Magnesium deficiency may cause a characteristic interveinal yellowing of the lower or middle leaves. When this symptom appears on the growing crop, magnesium sulfate should be applied to the soil in water two or three times at 2 pounds per 1000 square feet or to the leaves once as a spray at 5 pounds in 100 gallons of water.

We have found that soil-borne diseases that attack plant roots are a difficult and persistent problem in greenhouses. One method of coping with this difficulty is to grow plants in an artificial medium. For a number of years English greenhousemen have been growing cucumbers on bales of grain straw with great success and the practice is now being used in Canada. It is also a useful technique for greenhouses where drainage is a serious problem. The nutrition program for any artificial culture procedure is of course considerably different from that for plants grown in soil. We are testing various types of artificial media at the Harrow Research Station and will be adjusting the feeding schedule, as our research reveals new information.

Greenhouse cucumbers must have a proper balance of mineral nutrients continuously to produce a full crop of high-quality fruit. The nutrients must be applied at the right times and in the proper amounts. The schedule given here is only a guide—one that can be adapted to suit seasonal greenhouse conditions. To estimate the fertilizer needs of a crop, watch its growth carefully and have soil tests made periodically and tissue tests if possible. No formula can ever take the place of good judgment, but the schedule is useful as a guide for keeping the nutrients properly in balance. ■

GUIDE TO WEEKLY APPLICATION OF FERTILIZER

	Recommended fertilizer (pounds per 1000 square feet)					Nutrients supplied (pounds per acre)			
Week	10-52-17	Potassium nitrate KNO_3	Diammonium phosphate $(NH_4)_2HPO_4$	Calcium nitrate $Ca(NO_3)_2$	Ammonium nitrate NH_4NO_3	N	P	K	Ca
1	2					9	20	24	
2	1					4	10	12	
3	1					4	10	12	
4	1	1		2	1	37	10	28	21
5	1	1		2	1	37	10	28	21
6	1	1		2	1	37	10	28	21
7	1	1		2	1	37	10	28	21
8	1	1		2	1	37	10	28	21
9	1	1		2	1	37	10	28	21
10	1	1		2	1	37	10	28	21
11		2	1	2	1	48	9	31	21
12		2	1	2	1	63	9	31	31
13		2	1	2	2	63	9	31	21
14		2	1	2	2	63	9	31	21
15		2	1	2	2	63	9	31	21
16		2	1	2	2	63	9	31	21
17		2	1	2	2	63	9	31	21
18		2	1	1	3	71	9	31	21
19		2	1	1	4	86	9	31	10
20		1	1	1	4	81	9	16	10
21		1	1	1	4	81	9	16	10
22		1			4	64		16	
23		1			4	64		16	
24					4	58			
25					4	58			
26					4	58			
Total	11	29	11	32	54	1323	209	587	345

D. H. PLAUNT and K. F. KEELER

Les services de CANFARM sont à la disposition des agriculteurs partout au Canada. Toutefois, afin d'assurer la bonne marche de l'opération, les adhésions pour l'année 1970 sont limitées à 5,000 exploitants. Les ministères provinciaux de l'Agriculture se sont chargés de la formation de leurs agents de liaison auprès des agriculteurs au fonctionnement du CANFARM. Ainsi, les agriculteurs que la chose intéresse peuvent s'abonner au système dès 1970.

The Canadian Farm Management Data System (CANFARM) is designed to provide farm people with the information they need for farm business management. It is also designed to do this as simply and easily as possible by letting the computer perform the arduous task of adding, subtracting, sorting, balancing, validating, calculating and summarizing the farmer's physical and financial data. Thus, the farmer is left with only the initial task of recording physical and financial data. Advice and guidance for the development and operation of CANFARM originates with the National Farm Management Committee (NFMC) which was organized in April, 1968, by the Canadian Agricultural Services Coordinating Committee (CASCC).[1]

In response to economic pressures in recent years, farming has become more and more business oriented, requiring the use of sound business management techniques. To help meet this need, farm management advisory programs have been expanded throughout the provincial extension services across Canada. These programs are designed to provide information and guidance to farmers in the use of such management tools as farm records, farm business analysis, budgeting, cash flow, and other business techniques. Basic to these tools are systematic farm records. The task of keeping records is usually disliked by farm people, but the information it provides is basic to farm management analysis, decisions and planning.

CANFARM's first objective is to provide a systematic way for a farmer to obtain a major portion of the information required for the management of his farm business. This is accomplished by providing a simplified recording procedure and coding system and a computer-processing system for sorting, calculating and preparing the various reports. These are mailed each month within 10 to 20 days after his data has been received.

The second objective is to provide a fund of factual information in a 'data library'. Widespread use of the System by farmers will provide data which are not now available and will greatly assist extension and research workers in analyzing farm problems and in

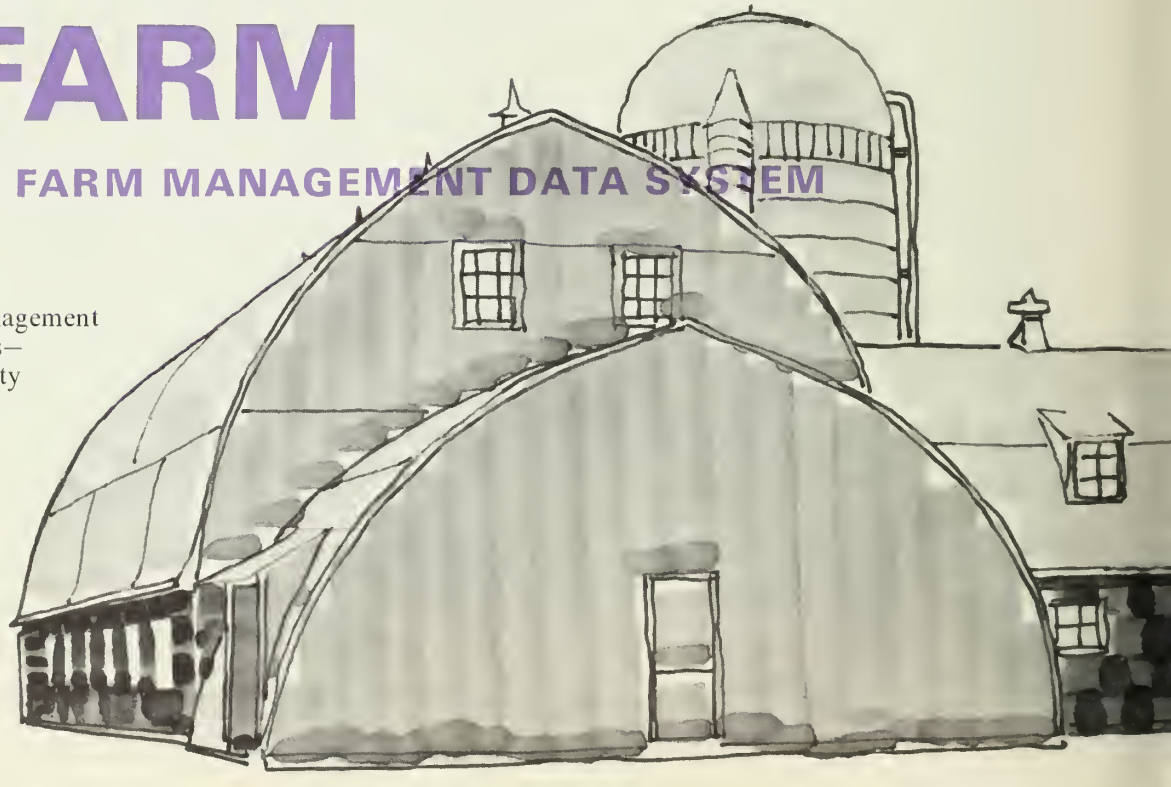
Dr. Plaunt is Director, Farm Management Division, CDA Economics Branch, Ottawa, Ont. and Mr. Keeler is Executive Director, "CANFARM", P.O. Box 1024, Guelph, Ont.

[1] Federal and Provincial Deputy Ministers of Agriculture; Deans of Faculties of Agriculture and Veterinary Medicine; Federal Assistant Deputy Ministers and Directors-General of Agriculture; Director, Agriculture Division, DBS; Director, Biology Division, NRC; Executive Director, Agricultural Education and Research Division, ODAF; President, Quebec Agricultural Research Council; and General Manager, Agricultural Institute of Canada.

CANFARM

THE CANADIAN FARM MANAGEMENT DATA SYSTEM

CANFARM—a new farm management program for Canadian farmers—is a federal-provincial-university service to farm people. It was developed to serve the farm record and farm management needs of today's commercial farmers. Its success depends upon the combined efforts of the farm management extension people throughout rural Canada.



Farmer and contact agent posting entries in farmer's journal.

CANFARM—to serve farm record and farm management needs of commercial farmers.

advising farmers on ways and means of increasing farm incomes. The records submitted to CANFARM are used to prepare averages and comparative analyses, but the confidential nature of the individual farmer's data is carefully maintained. Individual records cannot be released without the written permission of the farmer.

RESPONSIBILITY FOR IMPLEMENTING AND OPERATING CANFARM

In order to maximize CANFARM's usefulness to Canadian farmers, the National Farm Management Committee (NFMC) divided the responsibility of implementation, operation and development as follows:

(1) The provincial Departments of Agriculture, Universities, Farm Credit Corporation and other participating agencies are responsible for the resources and staff required for:
   (a) contacting farmers requiring the services of the CANFARM System;
   (b) instructing them in recording the necessary physical and financial transactions;
   (c) reviewing data submitted by the farmers for completeness and accuracy;
   (d) assisting farmers in interpreting the reports based on their own farming operations;
   (e) assisting farmers in interpreting the comparative analyses, based on the information available from other farms as well as from their own.

(2) Under the advice of the National Farm Management Committee, the CDA Economics Branch is responsible for the resources and staff for:
   (a) the establishment and operation of regional data preparation centers, for receiving source documents and preparing data for computer processing. These data preparation centers will be established in each province as required, for reasons of volume or service;
   (b) the development, testing and operation of
      Phase I —Monthly and Annual Reports and Analyses for the individual farmer.
      Phase II —Annual Comparative Analysis on similar groups of farms and enterprises.
      Phase III—Data Library with multi-purpose programs for retrieving the data required for extension work with the individual farmer, and for research and policy purposes.
      Phase IV—Farm Planning: the development and adaptation of new management techniques (such as Linear Programming and Simulation), in analyzing data collected from individual farms and in preparing alternative plans for the next year's farming operations.

RECORDING DATA

The farmer records, in the appropriate columns of a farmer's journal, all of the physical and financial information for transactions he makes. Every entry is identified by a code. The code indicates what the

item is, whether it was purchased or sold, and the enterprise or account with which it is associated. The information is then mailed to a processing center, coded on magnetic tape and processed with a large-scale computer.

The individual may receive monthly, periodic and annual reports based upon the option (or plan) selected. A list of some of the reports available for each option indicates the types of information that can be provided:

TYPE OF REPORT	OPTIONS		
	1	2	3
Monthly Enterprise or Account Report	x	x	x
Monthly Credit Account Report	x	x	x
Monthly Cash Flow and Account Summary Report	x	x	x
Periodic Livestock Analysis of Lots or Pens		x	x
Annual Enterprise (Livestock and Crop Analysis)		x	x
Annual Service Account Analysis		x	x
Annual Cash or Accrual Income Statement		x	x
Annual Net Worth Statement	x	x	x
Annual Capital Cost Allowance		x	x
Annual Landlord or Partner Statement	x	x	x
Tax Management Report		x	x

The *monthly reports* include an itemized listing of the receipts and expenditures for each enterprise or account, a statement of the current status of each credit account and a summary showing the totals for all enterprises and accounts. These monthly reports show the figures for the month and for the year to date. *Periodic reports* are also available; they may, for example, include an analysis for a given lot of hogs or pen of steers. The *annual reports* include a *cash income statement* to assist in the preparation of income tax returns. They also include an *accrual income statement* and *depreciation schedules* on both the straight line and diminishing balance methods. In addition, they include an *owner's equity statement* and a *financial analysis* of the business as a whole.

The most demanding and perhaps the most useful part of the System, however, involves the *analysis of each of the enterprise and service accounts* within the farm business. It shows the details for the specific enterprise and provides comparisons on a per head or per acre basis, with the averages for similar enterprises on other farms. An examination of the dollar figures will indicate how his enterprise compares with similar enterprises on other farms. If the results for an enterprise are unsatisfactory, examination of the measures of technical efficiency provided in the enterprise statement may help to pin-point what is wrong and point the way to increased profits. Both the dollar values and the physical amounts are required to enable the extension man to identify the problem and to suggest a possible solution.

Key punch operator punching data from farmer onto tape for computer processing.

WHO CAN PARTICIPATE IN CANFARM?

The basic idea behind CANFARM is to make it available to farmers in all parts of Canada. However, in order to facilitate the orderly implementation and operation of CANFARM, enrollment during 1970 is limited to 5000 farms. The provincial Departments of Agriculture are training their field staffs (farm management specialists or district agriculturalists) in the use of CANFARM. Interested farmers can be enrolled by the fieldmen and begin using the System during 1971. The projected volume for 1971 is approximately 10,000-12,000 farms.

The success of CANFARM depends upon its ability to serve the needs of the individual farmer. Some farmers want only the simplest kind of analysis and wish to record only the necessary minimum amount of data. Other farmers want a very complete and comprehensive analysis of their business operations. The CANFARM Record System will serve both of these groups, as well as the large group that falls between these two extremes. By providing a number of alternative options (plans), the farmer, in consultation with the fieldman, will be able to select the most suitable record system for his purposes, and progress from a simpler to a more complete option as his abilities improve and his operations expand.

INFORMATION REQUESTS

Anyone wishing more information on the Canadian Farm Management Data System should contact CANFARM's Executive Director, P.O. Box 1024, Guelph, Ont. ■

ACARIENS NUISIBLES AUX POMMERAIES DU QUEBEC ET LEUR REPRESSION

B. PARENT et M. MAILLOUX

The European red mite, the Two-spotted spider mite, the Apple rust mite and the Pear leaf blister mite are the main phytophagous mites of apple in Quebec. Effective control may be obtained with adequate measures and good timing.

Au Québec, quatre espèces d'acariens sont nuisibles aux pommeraies. Le tétranyque rouge, considéré comme l'un des principaux arthropodes qui s'attaque au pommier, se rencontre dans toutes les régions pomicoles du Québec; le tétranyque à deux points, que l'on rencontre également dans les mêmes régions, est de moindre importance et, par conséquent, beaucoup moins nuisible que le tétranyque rouge; le phytopte du pommier, qui est apparu récemment dans les pommeraies du Québec, semble prendre de plus en plus d'importance et enfin, le phytopte du poirier, qui avait une certaine importance il y a une décennie environ, se rencontre beaucoup moins fréquemment.

LE TÉTRANYQUE ROUGE

Le tétranyque rouge, qui se nourrit de la sève des feuilles cause une décoloration du feuillage, un ralentissement de la croissance des pousses, une diminution du nombre de boutons floraux et, parfois une chute prématurée des pommes. L'importance des dégâts varie selon l'époque de la saison. De façon générale, on considère que trois à cinq tétranyques par feuille au début de la saison causent autant de dommage qu'une vingtaine vers la fin de l'été.

Au Québec, il y a de 6 à 7 générations par année. Les œufs d'hivernement, pondus à partir de la mi-août jusqu'à la fin de septembre, éclosent le printemps suivant lorsque le pommier a atteint le stade du bouton rose. Les œufs d'été, pondus sur la face inférieure des feuilles, ont une incubation d'environ 10 jours. Aux stades nymphaux ils demeurent surtout à l'envers des feuilles et se nourrissent durant environ 8 jours. Comme la ponte moyenne d'une femelle est de 15 à 20 œufs et que la proportion des mâles est à peu près égale à celle des femelles, on peut facilement estimer que la progéniture d'une femelle de la première génération peut atteindre 2 millions d'individus à la cinquième génération.

Nos observations écologiques ont démontré que les populations de tétranyque rouge varient d'une année à l'autre et que les maximums oscillaient entre les mois de juillet et d'août. Ces fluctuations de popula-

M. Benoit Parent est agronome-entomologiste à la Station de Recherches du Ministère de l'Agriculture du Canada, St-Jean, Qué., et M. Marcel Mailloux est agronome-entomologiste à la Station de Protection des Vergers du Ministère de l'Agriculture du Québec, Farnham, Qué.

tions sont dues en très grande partie à la température, facteur clef qui influence directement le développement biologique de cet acarien. En effet, à des températures de 50-55°F., les œufs prennent 20-25 jours pour éclore tandis qu'à 75-80°F., ils éclosent en moins de 5 jours. Le tétranyque rouge est tellement dépendant de la température qu'on peut prédire certaines phases de son cycle en calculant les unités thermiques. Ainsi donc, en se basant sur un seuil de développement de 48°F., on a calculé que le tétranyque rouge atteignait une densité maximale après une accumulation moyenne de 1200 à 1300 degrés-jours.

La lutte contre le tétranyque rouge du pommier nécessite de très nombreuses interventions malgré la valeur des nombreux produits introduits maintenant dans la pratique agricole. La plupart des échecs sont dus à l'un des facteurs suivants: l'emploi d'un miticide inapproprié, d'une quantité insuffisante de bouillie, ou de doses trop faibles, l'exécution des traitements à une époque non optimale et, enfin la résistance aux pesticides.

La meilleure méthode de lutte contre ce tétranyque, consiste à faire des traitements préventifs au début de la saison avec des acaricides possédant une bonne rémanence. Le meilleur traitement consiste à faire un traitement à l'huile supérieure[1] seule ou à l'éthion-huile supérieure au moment de l'ouverture avancée des bourgeons, juste avant l'éclosion des œufs d'hivernement. L'huile enrobe l'œuf et tue l'embryon par suffocation, d'où l'importance d'appliquer une quantité suffisante de bouillie. Deux applications à demi-dose se sont avérées plus efficaces qu'une seule, justement parce que de cette façon l'on obtient un meilleur recouvrement. L'emploi de l'huile offre un grand avantage puisque cet acarien ne peut pas y acquérir de résistance dû au fait qu'elle tue les œufs de façon physique et non chimique. L'emploi d'acaricides spécifiques, tels le tétradifon, l'Animert, le Dicofol ou le Genite, au stade du bouton rose qui correspond sous notre climat à l'éclosion des œufs d'hiver, apporte également une très bonne répression de cet acarien.

Si les traitements préconisés avant la floraison n'ont pas été effectués, on peut utiliser des acaricides comme le tétradifon, le dicofol ou l'Omite, environ une dizaine de jours après le stade du calice. Ces traitements sont également considérés comme préventifs vu que les populations ne sont pas très élevées à cette époque.

Les traitements éradicants ou d'été sont nécessaires en juillet ou en août lorsque l'on voit des mites sur le feuillage. Comme on trouve tous les stades du développement du tétranyque rouge à cette époque de l'année, un traitement est nécessaire, même si l'on voit peu d'insectes adultes puisque les œufs et les

[1]Les huiles supérieures sont des huiles émmusionables ayant une viscosité de 60 à 70 à la seconde.

Fig. 1. Feuilles de pommier attaquées par le phytopte du poirier.

Fig. 2. Les deux feuilles de droites sont endommagées par le tétranyque rouge du pommier; celle de gauche est saine.

larves passent souvent inapperçus à cause de leur petite taille. Les seuls acaricides recommandés en été sont le tétradifon et l'Omite. Ces produits sont excellents, mais leur action acaricide est lente. Un acaricide idéal en été devrait posséder une action rapide et une bonne persistance. Dernièrement, le Morestan a été homologué pour usage en été au Québec. Ce produit a été éprouvé durant plusieurs saisons dans des essais expérimentaux et nous croyons qu'il sera d'une grande utilité dans la lutte contre le tétranyque rouge.

Plusieurs autres miticides prometteurs ont été mis à l'essai au Québec au cours des dernières années et seront sans doute recommandés aussitôt qu'ils seront homologués. Parmi ceux-ci, on peut mentionner les suivants: le Milbex, le Carzol, le Lovozal, L'Acarol, le Plictran, etc.

LE TÉTRANYQUE À DEUX POINTS

Le tétranyque à deux points cause les mêmes dommages que le tétranyque rouge et possède à peu près le même nombre de générations. Le facteur clef régularisant la dynamique de ses populations est également la température. Cependant, ce tétranyque a moins d'importance dans nos pommeraies que le tétranyque rouge à cause de ses habitudes polyphages. On sait qu'au début de la saison, il vit principalement sur les plantes couvrant le sol des vergers.

Le tétranyque à deux points est aussi sensible aux effets du climat que le tétranyque rouge et son développement biologique est inversement proportionnel à la température. Les œufs éclosent en 3 jours à une température de 75°F., mais peuvent prendre 24 jours à 52°F. A cause de sa biologie, il est très rare que l'on trouve cet acarien à l'état épidémique avant la fin de juillet. Il s'attaque au pommier surtout après la première coupe du gazon.

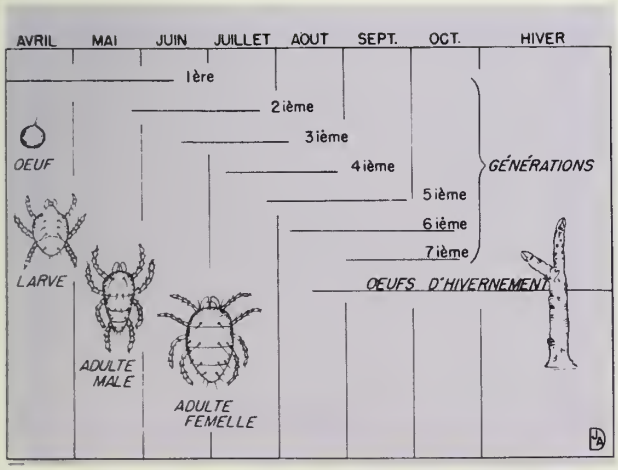


Fig. 3. Développement annuel du tétranyque rouge du pommier et nombre de générations.

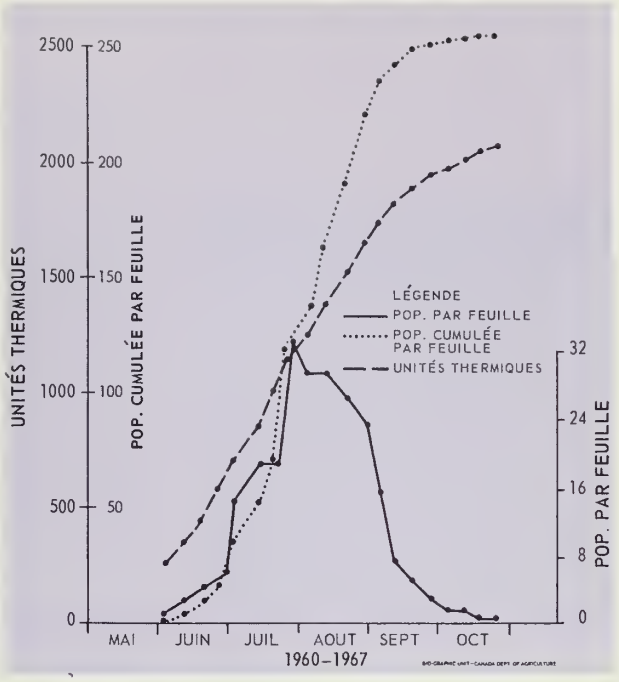


Fig. 4. Relation entre les unités thermiques et les populations estivales du tétranyque rouge du pommier.

L'emploi des acaricides Tétradifon, Omite ou Dicofol procure généralement une bonne répression de cet acarien.

LE PHYTOPTE DU POMMIER ET LE PHYTOPTE DU POIRIER

Le phytopte du pommier cause un roussissement du feuillage particulièrement à l'envers des feuilles. Cet acarien hiverne à l'état adulte sur l'écorce du pommier en colonies de 100 à 150 individus, particulièrement près des bourgeons. Il y a environ trois générations par année, et le maximum de population a lieu ordinairement en juillet.

Le phytopte du poirier attaque les feuilles en formant des vésicules vert pâle, à l'intérieur desquelles se nourrissent les jeunes nymphes. Plus tard dans la saison, ces vésicules tournent au brun et les feuilles se recroquevillent. Parfois, les plus endommagées tombent prématurément. Le dommage sur les fruits s'identifie d'abord par de petites taches vert pâle qui deviennent brunes en vieillissant. Ces dégâts ressemblent beaucoup à un roussissement. On peut confondre facilement ces dommages avec ceux occasionnés par certains pesticides phytotoxiques.

Règle générale, le phytopte du pommier et le phytopte du poirier ne nécessitent pas de traitements spécifiques. En fait, les traitements d'été contre les insectes soit avec du carbaryl ou du phosalone, les répriment de façon satisfaisante. ■

ECHOES
FROM THE FIELD AND LAB

Shown above are some of the Charolais cattle housed in the new maximum security livestock quarantine station at St. Pierre, which was officially opened last April. (see story below.)

On voit ci-dessus quelques-uns des bovins Charolais à la station de quarantaine à sécurité maximum de Saint-Pierre qui a été officiellement inaugurée en avril dernier (voir texte ci-dessous.)

ST. PIERRE QUARANTINE STATION OPENS A new maximum security livestock quarantine station was opened at St. Pierre on April 8 of this year, jointly by representatives of the French Ministry of Agriculture and the Canada Department of Agriculture. St. Pierre is a French island at the mouth of Fortune Bay, Newfoundland, in the Gulf of St. Lawrence.

The quarantine station was built and is being maintained by France. The Canada Department of Agriculture is in charge of health aspects of the station, including quarantine regulations and tests.

Quarantine regulations at St. Pierre are identical to those in effect at the CDA's station at Grosse Ile, about 40 miles east of Quebec City in the St. Lawrence river.

The Grosse Ile station, which is used to capacity, handles 240 cattle. The last importation into Grosse Ile was released April 1. There were 156 Charolais, 15 Limousin, 7 Maine-Anjou, 14 Pie Rouge from France and 44 Simmental from Switzerland.

The St. Pierre station can handle 200 cattle destined for Canadian farms. They originated from France and Switzerland and began their quarantine late last fall. They were released from quarantine on April 8 and were shipped by boat from St. Pierre early the following week. They included 146 Charolais, 23 Limousin, four Pie Rouge, two Maine-Anjou from France, as well as 11 Simmental and one Brown Swiss from Switzerland.

During the past several years, the demand for import permits has exceeded the space available for quarantine. The new St. Pierre station will help to meet the growing need for space.

Canadian farmers are required to obtain CDA import permits and to pay the costs involved in importing cattle. Terms are similar to those in effect at Grosse Ile.

INAUGURATION DE LA STATION DE QUARANTAINE DE SAINT-PIERRE Des représentants des ministères de l'Agriculture de France et du Canada ont inauguré conjointement, à Saint-Pierre le 8 avril dernier, la nouvelle station de quarantaine à sécurité maximum pour bestiaux. Saint-Pierre est une île française face à la baie Fortune à Terre-Neuve, dans le golfe du Saint-Laurent.

Cette station de quarantaine a été construite par la France qui en assurera également l'entretien, tandis que le Canada assumera toute responsabilité en ce qui a trait à l'hygiène vétérinaire, y compris les règlements et les épreuves sanitaires.

Les règlements à Saint-Pierre sont les mêmes que ceux en vigueur à la station de quarantaine du ministère de l'Agriculture du Canada à Grosse île, située à une quarantaine de milles en aval de la ville de Québec, dans le Saint-Laurent.

La station de Grosse île, utilisée à pleine capacité, peut abriter 240 têtes de bétail. Les derniers bovins stationnés à Grosse île cet hiver ont été libérés le 1er avril: au total, 156 bêtes de race Charolaise, 15 de race Limousine, 14 de race Pie Rouge et 7 de race Maine-Anjou, achetées en France, ainsi que 44 de race Simmenthale provenant de la Suisse.

Quant à la station de Saint-Pierre, elle loge 200 bovins destinés aux fermes canadiennes d'élevage. Originaires de France et de Suisse, ils sont en quarantaine depuis l'automne dernier.

Les animaux qui ont complété leur quarantaine le 8 avril seront expédiés par bateau de Saint-Pierre dès le début de la semaine suivante. L'expédition comprend 146 têtes de race Charolaise, 23 de race Limousine, 4 de race Pie Rouge et deux de Maine-Anjou, toutes achetées en France, ainsi que 11 de race Simmenthale et une Suisse brune, ces dernières achetées en Suisse.

Depuis plusieurs années, les demandes de permis d'importation dépassent de beaucoup la capacité des installations de quarantaine. La nouvelle station de Saint-Pierre aidera à corriger cette situation.

Les agriculteurs canadiens doivent se procurer des permis d'importation du ministère de l'Agriculture du Canada et solder les frais d'importation. Les dispositions en vigueur à Grosse île s'appliquent à Saint-Pierre.

FCC LOANS DECLINE Fewer farmers obtained long-term mortgage loans from the Farm Credit Corporation during the fiscal year ended March 31, 1970, than during the previous year.

Figures recently released by the Corporation show that 5,829 mortgage loans amounting to $160,466,000 were approved during the 1969-70 period. This compares with 9,159 loans valued at $208,330,500 approved during the preceding year.

Main reason for the drop was that farmers, facing a period of uncertain markets and prices for farm products, were reluctant to incur costs for capital expansion.

Geographical distribution of loans with the previous year total shown in brackets, was as follows: British Columbia, 248 (359) loans for $8,251,800 ($9,773,900); Alberta, 1,492 (2,055) loans for $42,767,700 ($48,178,200); Saskatchewan, 1,488 (2,853) loans for $38,602,300 ($64,364,-300); Manitoba, 604 (935) loans for $17,295,900 ($21,098,600); Ontario, 1,116 (1,488) loans for $32,612,800 ($35,159,200); Quebec, 715 (1,194) loans for $16,149,400 ($23,201,200) and Atlantic Provinces, 166 (275) loans for $4,786,100 ($6,555,100).

During the year, the Corporation was authorized to make loans to Indians farming on reserves. The FFC approved 48 loans amounting to $933,000.

RÉDUCTION DES PRÊTS À LA SCA Au cours de l'année budgétaire qui a pris fin le 31 mars 1970, la Société du crédit agricole (SCA) a prêté à moins de cultivateurs que durant l'année précédente.

Les chiffres que vient de publier la Société démontrent que l'on a approuvé 5,829 prêts hypothécaires d'une valeur de $160,466,000 durant la période de 1969-1970, comparativement à 9,159 prêts d'une valeur de $208,330,500 consentis l'année précédente.

La principale raison de cette diminution a été le fait que les cultivateurs ont hésité à faire des dépenses d'immobilisation en une période marquée d'incertitude pour les marchés et les prix des produits agricoles.

Voici la répartition géographique des prêts avec le montant correspondant pour l'année précédente entre parenthèses: Colombie-Britannique, 248 (359) prêts d'une valeur de $8,251,800 ($9,773,900); Alberta, 1,492 (2,055) prêts d'une valeur de $42,767,700 ($48,178,200); Saskatchewan, 1,488 (2,853) prêts d'une valeur de $38,602,300 ($64,364,300); Manitoba, 604 (935) prêts d'une valeur de $17,295,900 ($21,098,-600); Ontario, 1,116 (1,488) prêts d'une

ECHOS
DES LABOS ET D'AILLEURS

valeur de $32,612,800 ($35,159,200); Québec, 715, (1,194) prêts d'une valeur de $16,149,400 ($23,201,200) et provinces de l'Atlantique, 166 (275) prêts d'une valeur de $4,736,100 ($6,555,100).

Durant l'année, la SCA a consenti des prêts à des Indiens cultivant des terrains dans des réserves. Elle leur a accordé 48 prêts d'une valeur de $933,000.

RUSSIAN FORAGES ON PRAIRIES Two Russian forage crops may give Canadian cattlemen a welcome boost on prairie range land. Both varieties show excellent promise under Canadian conditions. Only rarely do introduced species prove to be as adaptable as these varieties to Canadian conditions.

The two are Altai, a wildrye grass, and Cicer milk vetch, a legume. Both should help cattlemen get more production from their present range land.

Altai has been undergoing tests at the Canada Department of Agriculture Research Station, Swift Current, Sask., for a number of years, and, for a shorter period, at the CDA Research Station, Lethbridge, Alta. So far, it has shown itself to be well adapted to Canada's drier range areas and appears to be equal in performance to Russian wildrye grass.

Cicer milk vetch is also adapted to these drier areas, and to the foothill regions of Alberta. It thrives in areas where timothy grows, tending in fact, to crowd out the timothy. It appears to be very hardy, and has the added advantage of being non-bloating. It is creeping rooted like Rambler alfalfa and is reputed to be long-lived.—S. SMOLIAK, LETHBRIDGE, ALTA.

YUKON SWEET CLOVER A new variety of sweet clover which is particularly well adapted to western Canada has been developed at the Canada Department of Agriculture Research Station, Saskatchewan, Sask.

Yukon, the new variety, is basically a very winter-hardy strain of the popular Madrid variety which is extensively grown in the United States.

Madrid sweet clover was first introduced into Saskatchewan in 1950. Initial field plantings winter-killed severely, particularly over the winter of 1953-54, and natural selection eliminated all but the most winter-hardy plants. Further selection on this winter-hardy strain was carried out, and the Yukon variety was formed.

Compared with the standard yellow blossom variety Erector sweet clover, Yukon yields eight per cent more forage and 18 per cent more seed.

A comparison of Yukon and Madrid has shown that forage yields of Yukon are nine per cent higher and seed yields 22 per cent higher when grown in the rigorous prairie climate.

Yukon is much more winter-hardy than Madrid and even somewhat hardier than the standard Canadian varieties Erector and Arctic.

It is shorter than Madrid, particularly in the seedling year of growth. Yukon has greater tolerance to mowing in the seedling year than Madrid and is more tolerant of fall frosts.

Seedling vigor in Yukon is outstanding compared to other common sweet clover varieties. This is a particularly important attribute for successful seedling establishment in the dry temperate climate of western Canada.

No seed of Yukon will be available for distribution in 1970. However, it is expected that a minimum of 8,000 pounds of Foundation seed should be harvested this year from 40 acres established in 1969.—B. P. GOPLEN, SASKATOON, SASK.

NEW RHODODENDRONS AND AZALEAS Plant scientists at the Canada Department of Agriculture Research Station, Kentville, N.S., are producing an exciting array of rhododendron and azalea varieties for home gardeners in the Atlantic provinces.

Only a few rhododendron catawbiense hybrids were being recommended for the region when a variety testing and breeding program was launched in 1952. Recommendations at that time were limited to some hybrids that had been grown at the station since 1919.

Since the beginning of the project, however, the Kentville scientists have built up a collection of 80 species and 150 named varieties of rhododendrons and azaleas from around the world.

So far 27 of them have proved satisfactory in the evaluation trials and are being recommended for use in the Atlantic region. They range from dwarf rhododendron species for rock gardens and border plantings to brilliantly colored azaleas that came from the Rothchild estate in England. Also included are conventional rhododendrons that far surpass many of the old catawbiense hybrids.

Until propagation and a buildup of stocks, it may be hard to get these varieties from nurseries in the Atlantic provinces. Meanwhile they may be obtained elsewhere—and those who would like to do so, can get a list of Canadian and American nurseries specializing in rhododendrons and azaleas by writing the Kentville Research Station.

Prospects are excellent that the breeding program under way at the station will add other varieties for use in the region. Two objectives of the program are the development of hardy, compact rhododendrons and the production of a satisfactory yellow-flowered variety.—D. L. CRAIG, KENTVILLE, N.S.

NOUVEAUX RHODODENDRONS ET AZALÉES Les travaux des chercheurs de la Station fédérale de Kentville ont conduit à la découverte d'une gamme merveilleuse de variétés de rhododendrons et d'azalées.

Jusqu'ici, seuls quelques hybrides de rhododendrons catawbiense, cultivés à la Station depuis 1919, étaient recommandés dans la région atlantique.

Mais en 1952, on a mis sur pied un programme d'essai et de croisement des variétés.

Depuis lors, les chercheurs de Kentville ont constitué une collection de 80 espèces et de 150 variétés de rhododendrons et d'azalées originaires de toutes les parties du monde.

Jusqu'à présent, 27 d'entre elles ont satisfait aux essais. Elles vont du rhododendron nain pour les rocailles et les bordures de plate-bande jusqu'aux azalées dont les couleurs chatoyantes sont originaires du domaine Rothschild, en Angleterre. Il y a aussi les rhododendrons traditionnels qui dépassent de beaucoup les vieux hybrides de catawbiense.

On peut avoir des difficultés à se procurer ces variétés chez les pépiniéristes locaux, car il faut d'abord les propager et en constituer des stocks. Entre temps, on peut se les procurer ailleurs, la Station de Kentville vous enverra, si vous le désirez, une liste des pépiniéristes des États-Unis et du Canada qui se spécialisent dans la culture des rhododendrons et des azalées.

Le programme de croisement entrepris à la Station donnera quelques variétés adaptées à la région atlantique. On essaie surtout de produire des rhododendrons résistants et compacts et on recherche une bonne variété à fleurs jaunes. Ce sont là deux objectifs du programme.—M.D.L.CRAIG, KENTVILLE, N.E.

NORTHERN TOMATOES Several new tomato varieties that will produce fruit in spite of cool summer temperatures have been developed at the Canada Department of Agriculture Research Station, Beaverlodge, Alberta.

Most commercial tomatoes won't set fruit when the night temperature falls below 55 degrees; the new varieties do so under much cooler conditions.

Three new types should be available from commercial seed suppliers in 1971, extending the area in Canada's north where home gardeners can grow their own tomatoes.

The new products were tested in Beaverlodge stores several years ago. At first consumers did not want to buy the relatively small tomatoes, about the size of a golf ball, or 1¼ inches in diameter. However, as housewives tried them, they became popular and sold well. In one three week period, for example, 2,200 pounds of them were bought.—R. E. HARRIS, BEAVERLODGE, ALTA.

THE FASTEST FUMIGATION IN THE WEST

BEN BERCK

De nouvelles méthodes permettent de déceler rapidement si les résidus de fumigants sont chimiquement ou physiquement liés aux grains.

Certaines techniques d'identification et de mesure permettent d'analyser en 15 secondes des quantités aussi minimes que 5 picogrammes. (5 parties par trillion d'un échantillon d'un gramme).

Fumigants are gaseous pesticides with a wide range of uses. At the CDA Research Station, Winnipeg, Man., we use advanced methods of chemical analysis to investigate distribution patterns and persistence of fumigants when applied to stored grain and other products. Our objectives were two-fold:

First, to determine the relationships between the biological effectiveness of the fumigation to control insects, molds and bacteria that may infest stored grain, the type and amount of fumigant applied under the particular environmental conditions, and the actual gas concentrations at various parts of the storage at any given time.

Second, to obtain information on the nature and amount of the pesticide residues, if any, that may remain in or on the food product after fumigation. Our overall aim is to get the best combination of effectiveness with the least amount of undesirable side effects (e.g., taint, discoloration, lowered nutritive value, lowered germination, high residue levels) coupled with the least amount of fumigant required for control purposes.

In the course of our work, we established that wheat behaves as a gas chromatographic column towards fumigant gases. Under actual conditions as found in a country elevator or farm granary, we found that the components of a mixture of fumigant gases applied to the surface of a bin of wheat emerge from the bottom (some not at all!) at quite different rates and in different amounts in their downward migration. Such separation is indeed similar to that obtained with specially packed columns used in analysis by gas chromatography, the modern chemist's favorite analytical tool for resolving complex mixtures of pesticides, drugs, biological products, etc. The nature, particle size, temperature and moisture content of the cereal mass affect the chromatographic behavior. We used both polarography (an electrochemical method) and gas chromatography to derive sorption patterns of methyl bromide, ethylene dibromide, ethylene dichloride, acrylonitrile, chloropicrin and carbon tetrachloride. Fig. 1 shows part of the gas chromatographic apparatus used for such work. We readily measured one part per million of these gases in the air between kernels of stored grain.

We recently conducted intensive research on phosphine, PH_3, the active component of the commercial grain fumigant known as Phostoxin® . With gas chromatography, we are able to measure with considerable specificity amounts of PH_3 as small as 5 picograms (an amount one million times smaller than 5 micrograms), with a precision within 6 per cent within 15 seconds from time of sample injection into the apparatus. Five picograms of PH_3 per gram of cereal product corresponds to 5 parts per trillion, which is equivalent to the astronomical ratio of *1 inch in 3,150,000 miles!* Calculated similarly, 1 part per million corresponds to a ratio of *1 inch in 15¾ miles.* Both ratio s illustrate the almost inconceivably low limits of detection of particular molecules that can now be attained with modern methods.

In previous investigations of sorption of fumigant gases, we used steel columns 90 inches in height and 4-inch diameter, each containing 30 pounds (13,500 grams) of wheat. Aeration periods varied from 4 hours to 13 days. We also employed columns containing 300 pounds of grain. We can now get similar information easier and faster by using mini-columns each containing ½ to 2 grams of ground cereal prod-

Ben Berck is in charge of the Fumigant Chemistry Laboratory, CDA Research Station, Winnipeg, Man. The research on new methods for phosphine was done during his recent transfer-of-work for one year at the University of California, Riverside, California.

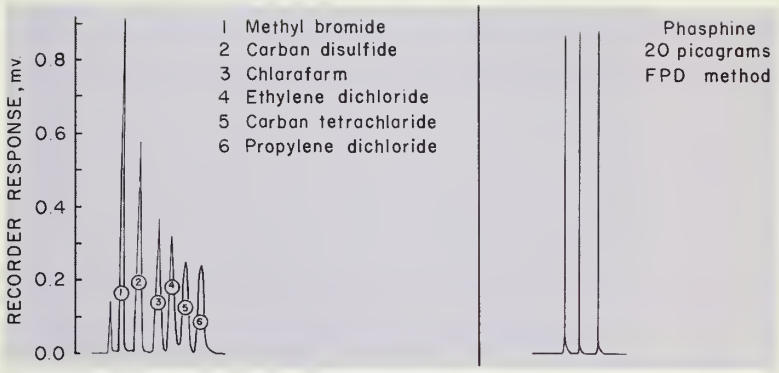
uct. Hooked up directly to a gas chromatograph the sorption of trace amounts of fumigant gas can be determined within 15 seconds. From this we gained the impression, recently confirmed, that this was the "fastest fumigation in the West!" We also did similar experiments with methyl bromide with another but less sensitive method of detection.

In another experiment, we simultaneously determined the uptake by insects of lethal and sublethal amounts of PH_3 in microfumigation chambers. Here we placed insects in small microfumigation cells of 5 cubic centimeters (about 1/6 ounce) capacity fitted with special silicone rubber stoppers. Amounts of PH_3 ranging from 4 to 120 micrograms/liter air were applied at four temperatures. Fig. 3 shows a sequence of development of three types of vessels used here for this aspect of fumigant research.

Mini-vials are used to evaluate the toxic effects of small amounts of fumigant gases. This method allows considerable experimental variation, and improves the monitoring of small changes in gas concentration in the environments within individual vials. This is an additional example of how increase in sensitivity of detection enables miniaturization of assay methods, with resultant savings in time, space and equipment.

Fig. 2 shows automatically recorded gas "chromatograms" of small amounts of various fumigant gases.

Stemming from methods research such as briefly mentioned herein, new approaches to use of gaseous pesticides (fumigants) are being examined. For example, we are particularly concerned about the favorable conditions for insect and mold development posed by the mountains of wheat that presently must be stored on the farms. We plan to investigate the possibility of utilizing combinations of the natural inter-kernel atmosphere with traces of fumigant gases to control insects and molds more effectively. If this approach proves applicable, the cost of fumigation and amount of fumigant residues will be reduced. ■



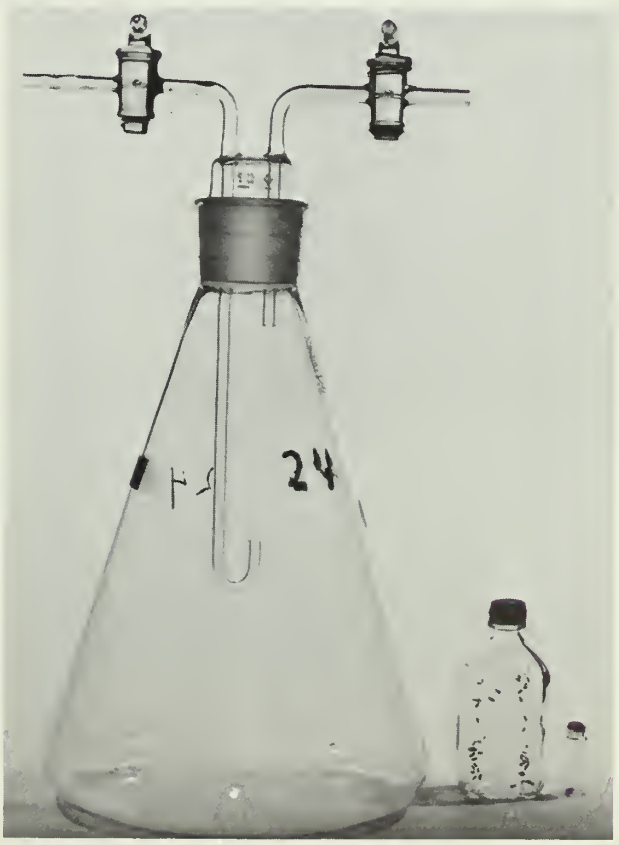


Fig. 1. (Top) Author with gas chromatographic apparatus.

Fig. 2. (Center) What fumigant peaks look like on a gas chromatograph recorder. Left: A chromatogram of a mixture of 6 fumigants, each in 1-microgram amounts, showing separation by the column within 4 minutes. Right: Three consecutive determinations, each of 20 picograms phosphine, automatically recorded within a total elapsed time of 31 seconds (widely recognized as the 'fastest fumigation in the West').

Fig. 3. (Bottom) Miniaturization to assist evaluation of toxicity. Left: A 6.4 litre-flask, widely used in fumigant research. Center: A 4-oz. capped medicine bottle containing insects fumigated with a trace of phosphine mixed with CO_2. The bottle is readily sampled for analysis. Method developed by Berck (1964). Right: A 1/6 oz. mini-vial containing test insects to evaluate small dosages of fumigant gases. Gas concentrations are sampled periodically by microsyringe to determine uptake by insects. Method by Berck (1968).

BIOLOGY AND CONTROL OF

fusarium wilt of muskmelon

R. N. WENSLEY

Le fongicide Benlate subit des essais relatifs à son efficacité contre la flétrissure fusarienne du melon muské et contre les champignons qui causent le blanc.

Fusarium wilt (*Fusarium oxysporum* f. *melonis*), a highly destructive disease of muskmelon, has taken its toll of the melon crop in southern Ontario in the last three decades. Before 1940, wilt susceptible varieties of high quality produced excellent yields, and the industry looked secure. However, with the appearance of wilt in the early forties, the soil-borne causal fungus rapidly established itself and spread throughout the melon-growing areas. After a few years, fungus build-up wilt caused a high mortality in plants before harvest.

Although the introduction of a few wilt-resistant varieties has been a partial solution to this problem, many attempts to control the fungus in the soil before it enters the plant have been carried out. Recent studies in chemical control show promise.

The muskmelon wilt *Fusarium* represents a group of organisms whose propagules (chlamydospores) persist many years in soil. Resistant to high and low temperatures and to many fungicides chlamydospores lie dormant in soil until roots of a suitable host are grown nearby. After root infection and subsequent rapid development of the fungus in the plant, populations of spores increase rapidly to levels capable of destroying a planting. Because a susceptible variety of melon remains susceptible to wilt throughout its life, to be satisfactory any control measure must protect the host during its entire period of growth. Few chemicals have shown sufficient fungicidal capability and persistence in soil to achieve this protection and to permit a harvest from susceptible plants. However, three years of testing at the Harrow Research Station showed that an experimental 'systemic' fungicide, du Pont "Benlate" (benomyl) formerly fungicide 1991, has this capability and persistence in highly infested soils.

In two soils, (a dark organic Colwood Loam and a yellow sandy loam), cropped successively to susceptible Perfection variety for 18 years at the Harrow Research Station, Benlate inhibited an increase in populations of the *Fusarium* wilt pathogen in the presence of the host. Benlate extended the life of most plants to more than 85 days, and permitted a harvest to be taken. In addition this compound (used as a soil drench), controlled powdery mildew *(Erysiphe cichoracearum)* under conditions that favored a severe infestation.

The author is a plant pathologist at the CDA Research Station, Harrow, Ontario.

Opposite page: Perfection variety of muskmelons growing in treated and untreated soils.

The effectiveness of Benlate was conditioned by both the method of application and the amount used. Maximum effectiveness was obtained when the material was added as a drench to the planting medium and also to the infested field soil. Benlate was applied in the field at sites, 0.09m², at 0.91 m intervals in rows 1.82 m apart. Rates of 11.49 kg/ha in three applications of 3.83 kg/ha, 21 days apart, and 7.66 kg and 15.32 kg/ha in single applications on the day of transplanting, controlled wilt and powdery mildew and permitted a harvest. Highest yields were obtained when three applications rather than one were used to apply a given amount of Benlate. Amounts of material, below an optimum level, which failed to inhibit increases in populations of the wilt *Fusarium* in soil also failed to control wilt satisfactorily. On the other hand, amounts above the optimum range tended to retard growth of plants and the onset of fruit development temporarily.

Although more research is required to determine all factors relating to the fungicidal activity of Benlate in soil, its effectiveness against the muskmelon wilt Fusarium and the powdery mildew fungus, suggests a practical use for the compound in agriculture. Combating wilt by fungicidal applications of Benlate to soil would allow growers to use varieties of high quality that are presently not suitable because of their susceptibility to Fusarium wilt. At present, Benlate is being used for experimental purposes only and is not registered for use in Canada. ■

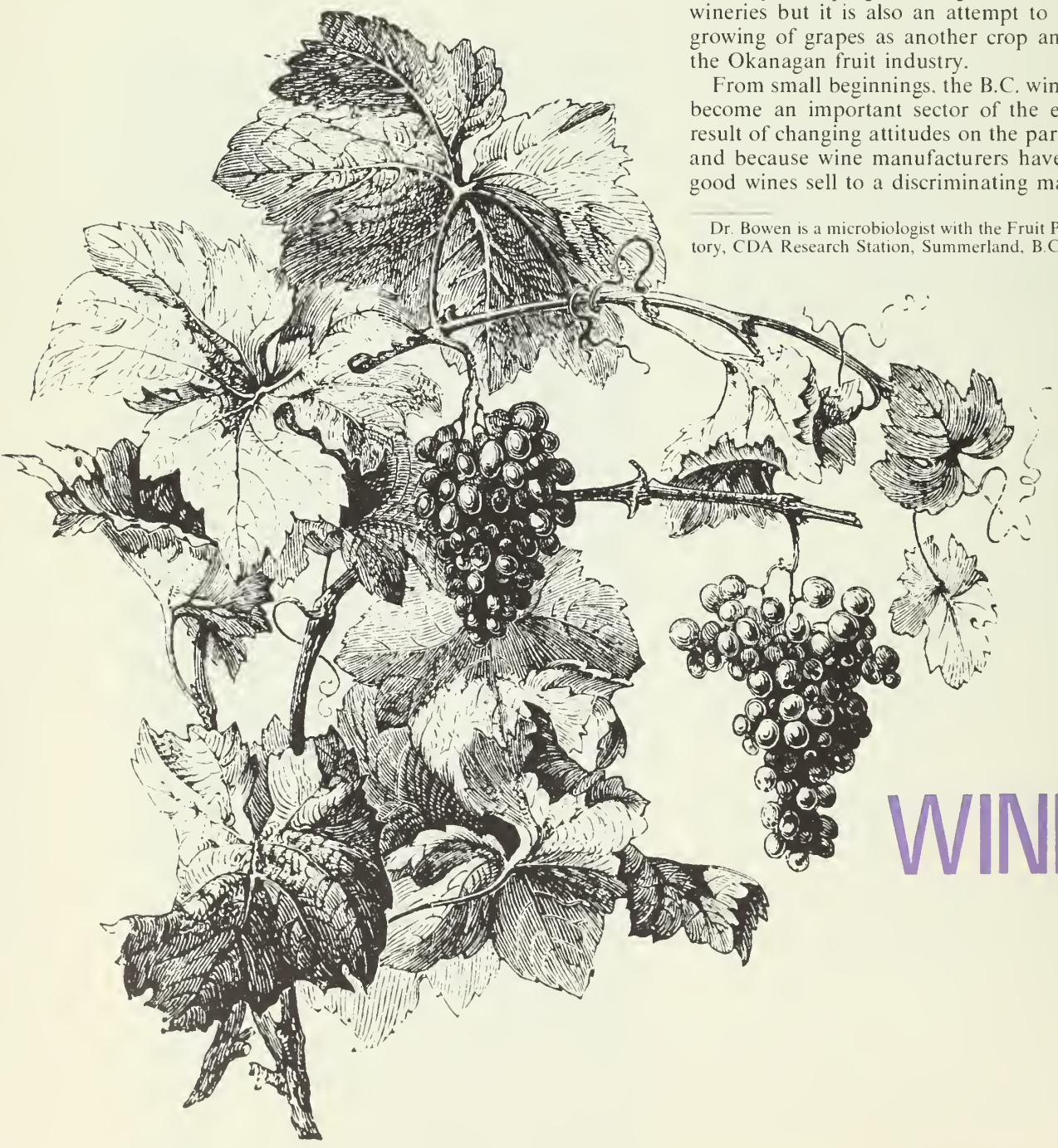
J. F. BOWEN

Des variétés de raisins sont essayées afin de découvrir leurs aptitudes à la fabrication commerciale du vin et pour promouvoir leur production en Colombie-Britannique.

At the CDA Research Station, Summerland, we are testing numerous grape varieties to find out how suitable they are to the British Columbia climate and how well suited they are to commercial wine-making. Not only is the program designed to assist commercial wineries but it is also an attempt to encourage the growing of grapes as another crop and so diversify the Okanagan fruit industry.

From small beginnings, the B.C. wine industry has become an important sector of the economy—as a result of changing attitudes on the part of the public and because wine manufacturers have realized that good wines sell to a discriminating market.

Dr. Bowen is a microbiologist with the Fruit Processing Laboratory, CDA Research Station, Summerland, B.C.



WINE AND

The manufacture of wines in the province is expanding rapidly. The impetus has been felt by grape growers who have increased production. Grape plantings up to 1960 were small, about 400 acres, mainly of the *Vitus labrusca* type. But, present acreage is close to 2,400 acres. This is planted mostly to improved hybrid varieties, which resemble the *Vitus vinifera* or European wine grape.

From the first commercial winery in the 'twenties', the industry has grown to six wineries. The companies produce a full range of wines, from dry table wines to dessert wines, sparkling wines of the champagne type to the less heavily carbonated 'crackling' wines.

Grapes for the British Columbia wine industry are obtained from local vineyards and California. Under a rather loose provincial regulation, British Columbia fruit must be used in conjunction with California fruit, roughly in a 65-35 proportion. The regulation does not state the proportion of each in the wine itself, rather it is designed to ensure that the wineries provide a market for all of the British Columbia grape crop. As a matter of fact, some of the wines are made exclusively from California grapes, others are from blends of fruit from each source. At present, 'varietal' wines from locally grown grapes are not produced in large quantities, except for the Riesling variety, since plantings of other suitable varieties are readily available. However, in the future, wines of this type, as in California, may become more important, and it is hoped may build a good reputation.

The wineries prefer to use grapes free from the 'foxy' flavor characteristic of the *Labrusca* type of grape. Dr. Fisher, head of the pomology division at Summerland, has been concerned in the search for hardy, mildew free, productive varieties, without this 'foxiness' and more typical of the European wine grape *Vitis vinifera.* He has introduced many new and improved hybrids from other areas for testing in the Station vineyard, and has hybridized many others. This work is still relatively new at the Station but has already resulted in the introduction to local vineyards of a number of very fine wine grapes, among them Seibel 9549, Foch, and Seibel 9110. These are now being grown on a large scale, and have been well received by the wine industry. Others, still not in full production but of very high potential, are New York 11927, Vineland 37022, and New York 12128. These varieties have not yet been given popular names, which is an indication of their newness.

In the Fruit Processing Laboratory we evaluate all new introductions at the Station for their wine-making potential. We have developed a standard procedure, for white and for red wines, which yields a product of constant quality, varying only in those qualities due to the grapes themselves. These test batches of wine are shown to the winery people each year for their appraisal. A tasting session acquaints them with the new developments and also enables the laboratory members at Summerland to find what qualities the wineries desire in a variety. It is an example of the cooperation which has always existed between the Summerland Station and growers and manufacturers of fruit and vegetable products.

The work of the Enology Section does not stop with fruit and wine evaluation. The search for 'varietal' wines may require that the fruit be treated in a different manner than for blended wines. With this in view, we have undertaken to use heat treatments for extraction of color and for modification of flavor in our wines. This has led to initiating studies on the color composition of juices and finished wines and will lead into flavor analyses. In these studies we use paper and gas chromatographic analysis. The studies have many applications to the overall study of wines.

We have also considered the use of fruits other than grapes for fermented drinks. Our first work in this field took place in 1954 when Atkinson and Bowen developed a carbonated apple wine. This was a good product, much like champagne, and was very well received. However, it was not a commercial success as it may have been ahead of its time. If re-introduced to the market it could possibly be a commercial success. Recently we have tried to modify it by adding small amounts of fruit juice concentrate, to make a fruit flavored, low alcohol beverage to be used as an aperitif. ■

WINE RESEARCH

Primary ditching.

Cross-member positioned for twist.

Ready for wooden slabs.

NEWFOUNDLAND PEAT BOGS

drainage techniques

A. F. RAYMENT

Dans le présent article qui traite du drainage des tourbières de Terre-Neuve, l'auteur décrit une expérience visant à rendre productif ce type de sol.

Drainage is the first requirement for bringing peat bogs into agricultural production. In our investigations at the CDA Research Station, St. John's West, Newfoundland, we use a high-speed rotating disc for primary ditching. The disc has beaters on the circumference which simultaneously excavate and disperse the excavated material as the disc moves slowly forward at a slight angle through the peat. This ditcher was developed by Mr. J. V. Healy of the provincial Department of Mines, Agriculture and Resources and is based on the same principle as various ditchers used in European commercial peat works, but incorporated in the design have been advantages such as light weight, ease of transport, simplicity of power transmission and ease of engine replacement. Fitted with the standard disc, it produces a ditch 24 in. deep, of semi-elliptical cross section at a rate ranging between 600 to 900 ft. per hour depending on conditions.

We have investigated the spacing and depth of ditches, supplemental drainage techniques such as ridging of row crops, the use of mole drains and covered drains and the special place of outlet drains.

The author is an agronomist with the CDA Research Station, St. John's West, Nfld.

In five successive years of comparing depths and spacing of ditches, we found that deepening the ditches from 2 ft. to 4 ft. did not lower the water tables at the land center as effectively as reducing the ditch spacing from 150 ft. to 75 ft. Forage crop yields were not significantly affected by differences in either ditch depth or ditch spacing. Part of the reason was that one of the components of the grass mixture was reed canarygrass, well known for its water tolerance. Our studies have shown that ditches should not be spaced much wider than 75 ft., as this minimizes ponding of water in depressions between ditches and provides for good sod to support livestock and machinery.

Land crowning is a technique which may be used to eliminate ponding and provide better drainage at the land centers between ditches. To do this, soil must be removed from the ditch edge to the center of the land, tapered gradually from each ditch to form an arched cross section or crown. We have tried this successfully on a small scale using a powered disc, but because of the great amount of material that must be moved, a much larger type of machine using a screw drive would probably be needed for a large-scale project. It is considered that the additional costs in land development might only be warranted for special cases such as the production of dried grass, meal or sods.

Another form of supplementary drainage useful in grassland production is the mole drain. This is simply an underground tunnel cut by means of a bullet shaped plug drawn through the peat at the desired depth. The implement in use in Newfoundland also was constructed by Mr. Healy, and is fitted with a large turning coulter which cuts the initial slit in the

peat, followed by a straight coulter which carries the bullet on the lower extremity. A tube leads from the outside atmosphere, along the straight coulter and to the rear of the bullet to allow free air entry thus reducing suction drag on the bullet. The whole is mounted on a standard three point linkage which can be used to adjust the depth of operation. The drains are set at 50-foot intervals to cross the open drains at an angle so that sufficient grade is supplied to provide water flow. A considerable slope, adequate to provide drainage, is available in all the peat sites under investigation in Newfoundland. Our observations have shown that these drains remain active for many years. They are very cheap to construct, so can be built as needed.

Drainage for vegetable crop production requires special considerations. Our experiments have shown that in most years, many vegetables respond to ridging, which is simply a means of supplying additional drainage. Also, in the yearly cultivation operations, the need for drainage is very important for support of machinery because there is no sod to bind the surface. We have found that a narrow ditch spacing of 25 feet will speed up drying of the peat in the spring. However, it is impractical to conduct farming operations with open ditches at such a frequency, and we have successfully tried a covered ditch of a type which has been used for many years in Norway. First, the field is ditched with relatively deep narrow ditches (34 in. deep × 12 in. wide) using the ditcher with a larger disc and narrow beaters. Then, with a very simple tool, wooden cross-members are lowered to about 8 in. above the ditch bottom and twisted so that the ends cut into the ditch walls. These cross-members, spaced at 5-foot intervals, are then covered with waste slabs, obtainable at a very cheap price from local sawmills. Ditches are easily back filled by running the tractor-powered rotary cultivator partly straddling the ditch, up one side and down the other.

If a peat bog tends to have ponds in the middle or to have a slightly hollow center, an outlet ditch may be the answer. If the bog is not too deep, it is often possible to dig the outlet ditch down to the gravel and use the excavated gravel as a road bed alongside the ditch. If, on the other hand, the bog is deep, we have found it is impractical to excavate to the bottom. In addition, the weight of spoil where the material is soft will often cause the walls of the ditch to cave, so that shoring of the sides with rough timber and slabs becomes necessary.

Our research has revealed that a back-hoe behind a standard crawler tractor converted for bog use is ideal for excavating outlet ditches. Before constructing such a ditch, it is necessary to establish the bottom and surface contours of the bog in order to determine the depth needed to permit a free flow. This is especially important where the floor of the bog is dish-shaped, requiring a considerable cut into the mineral soil near the perimeter. Also to be considered are the eventual effects of drainage on the surface contour of the bog and consequent effects on drainage.

In this experiment, the outlet ditch was laid to intersect with the lateral covered ditches and was more conveniently constructed after the laterals, since the ditch and resulting spoil was found to impede the normal ditching process.

While it has been readily apparent that the increased frequency of ditches results in a better overall drainage and makes it possible to work the land earlier in the season, it has been difficult to demonstrate the effects on crop yields because of the overriding effects of row ridging. Thus, with reference to Table 1, excellent yields of turnips were obtained on a dry year, regardless of the treatment, while on a wet year, they did not grow satisfactorily without ridges. The effects of ditch spacing on turnips showed up only a very wet year where they were not ridged. On the other hand, carrots grown on ridges benefited from closer spaced ditches, but again, only on a very wet year. In general, vegetable crops need to be grown primarily on ridges, and the use of closely spaced covered ditches contributes mainly in allowing earlier working of the land and further promotes yields on very wet years.

Caution should be exercised, of course, before applying these methods to other areas of Canada: the annual precipitation in Newfoundland is somewhat more than 60 in. and the climate is cool. Thus, we need extreme ditching measures to significantly lower the water tables in our highly impermeable peats. Where the precipitation is substantially less, overdrainage could very easily occur, so the ditch spacing would have to be increased relative to the conditions, in consultation with local experts. Overdrainage can lead to an excessive rate of decomposition of the peat and eventual loss of the resource in a relatively short period of time. ■

TABLE 1. THE EFFECTS OF DRAINAGE TREATMENTS ON THE YIELDS OF TURNIPS AND CARROTS ON A NEWFOUNDLAND PEAT SOIL.

Ditch Spacing	Turnip Yields Cwt/Acre				Carrot Yields Cwt/Acre	
	Dry Yr. (1967)		Very Wet Yr. (1969)		Mod. Wet Yr. (1968)	Very Wet Yr. (1969)
	Ridged	Not Ridged	Ridged	Not Ridged	All Carrots Ridged	
25′	623	616	262	78	228	88
50′	614	597	265	49	232	43
100′	595	533	267	31	189	27

Low yields in 1969 partly due to poor growing season and partly to a premature harvest date necessitated by early staff lay-off.

THE TUBER FLEA BEETLE IN B. C.

F. L. BANHAM

L'altise des tubercules est l'un des principaux fléaux de la pomme de terre en Colombie-Britannique. Un programme combinant, sur le même terrain, l'échantillonnage des feuilles et la lutte, entrepris par les producteurs de pommes de terre d'une région, a grandement amélioré l'efficacité de la lutte contre ces insectes et a permis de réduire le traitement des feuilles de 30 à 60%.

The tuber flea beetle is one of the most important insect pests attacking potatoes in British Columbia. The adult beetle causes little damage by feeding on the foliage of the plant but the larvae of this insect causes extensive damage by making a shallow network of fine tunnels beneath the skin of the potato tubers when feeding. Soon after the larvae have completed feeding, the abandoned tunnels are filled with brown cork tissue which prevents the entry of foreign organisms. Deep peeling is necessary to remove these rubbery, thread-like complexes from beneath the skin; feeding damage by two or more larvae will make a potato unmarketable for table use. The outer appearance may also be adversely affected. Feeding damage during early development of a tuber may result in deep cracks, rough scab-like skin and knobbiness. The importance of having an effective, economic control for the tuber flea beetle is obvious. To accomplish this objective, unknown aspects of the biology, life history, and habits of this insect were investigated at the Research Station, Summerland. Field and laboratory trails were also conducted to evaluate the effectiveness of newly developed insecticides and methods of application.

The tuber flea beetle probably originated in Colorado where it was native on Solanaceous weeds such as wild ground cherry, buffalo-bur and nightshade. Following introduction of the closely related Irish potato, it adapted to this new food source and now, it is virtually host specific on this plant. The tuber flea beetle gradually spread throughout the Pacific Northwest and by 1940, it was found in the lower Fraser Valley of British Columbia. By 1962, all of the important potato growing areas in the province were infested. The tuber flea beetle has rapidly become economically important wherever it has established. It does not occur elsewhere in Canada.

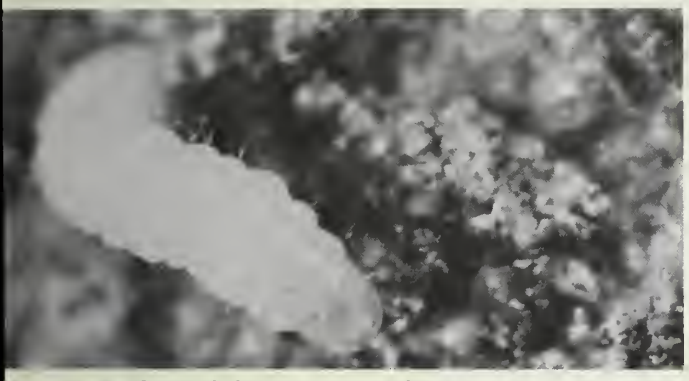
Adult tuber flea beetle

Like many insects which are of economic importance, the tuber flea beetle is not easily controlled. Many aspects of the life history add to the difficulty of developing a simple, effective control program. Compared to many economic pests the tuber flea beetle has a combination of survival characteristics which give it a maximum degree of protection against parasites, predators and other hazards in its environment. Adult flea beetles are very small, averaging less than one-sixteenth inch in length. They overwinter in the soil at depths down to twenty-four inches depending on soil type. Keen senses enable them to detect potato plants in distant, isolated fields. In experimental plots at Summerland, overwintered beetles locate and commence feeding on potato foliage the day they emerge from the soil. Beetles being highly mobile in the air and on the ground are a constant threat to all potato fields within and adjacent to an infested area. The hazard increases during the growing season when adjacent fields of earlier maturing potatoes are harvested forcing the beetles to migrate to new hosts. There are two and occasionally a partial third generation of tuber flea beetles per year depending on the length of the growing season and the weather conditions. Although larval feeding damage occurs in detectable peaks there is a high degree of overlapping between each generation. Thus, a constant barrier of insecticide is required for season-long control. The rapidity with which an infestation can develop during the season is indicated by the biotic potential. For one pair of over-wintered adults this theoretical factor would be about 22,000 beetles for two generations. Female beetles deposit eggs singly on or adjacent to developing tubers. Overwintered females lay about 156 eggs and first generation females about 278 eggs over a period of 26 to 69 days. Minute white larvae hatch and bore through the skin of the tuber to commence feeding.

The author is an entomologist at the CDA Research Station, Summerland, B.C.

Once inside the tuber larvae are protected from contact with insecticides as well as from attack by predators and parasites. In British Columbia, no predators or parasites of the tuber flea beetle have been recorded although a nematode parasite was reported in Oregon.

Following the introduction of the tuber flea beetle into British Columbia in 1940, severe feeding damage on the tubers soon forced many potato growers out of production. Several years later, an acceptable foliage adulticide treatment was developed by joint efforts of researchers at Kamloops and Agassiz. This treatment killed beetles feeding on the foliage before they could lay eggs. Control effectiveness depended on applying sprays or dusts of DDT to the foliage



Tuber flea beetle larva entering a tuber

at regular intervals throughout the growing season. Up to seven treatments were required for main crop potatoes to control the native population as well as migrants from nearby fields.

In 1953, soil treatments of aldrin, chlordane, dieldrin, or heptachlor were introduced. These cyclodiene insecticides were very effective and more reliable than the DDT foliage treatment. One application mixed into the soil before or after planting controlled beetles and larvae. Overwintered beetles were killed before emerging from the soil in the spring as were overwintered, first or second generation beetles entering the soil to lay eggs on the developing tubers or larvae crawling over the surface of the tubers. In some areas there were indications that the tuber flea beetle was developing resistance to the cyclodienes and this was confirmed in laboratory bioassay tests in 1963 and 1965. The tests also showed that there was a high degree of cross-resistance to DDT.

Recent work at this Station has been aimed at replacing the extremely persistent cyclodiene soil treatments with less persistent but equally effective materials that leave no residues. Laboratory and field experiments have been conducted on contact and systemic insecticides to determine optimum timing and placement in the soil and effectiveness against two complete and a partial third generation of the tuber flea beetle. None of the currently available test insecticides applied as pre-emergence soil treatments has adequately controlled beetles and larvae beyond the first generation. Combined pre-emergence and mid-season soil treatments have been equally ineffective. The presence of potato vines makes proper placement of the mid-season treatment impossible.

Until more persistent soil insecticides are available foliage treatments offer the only alternative for controlling the tuber flea beetle. In 1968, promising results were obtained from a small-scale, combined area control and foliage sampling program in an isolated field in the secluded Salmon River Valley. In 1969, in cooperation with Mr. J. C. Arrand, entomologist, Dr. S. Dhindsa, field crop specialist, British Columbia Department of Agriculture and all commerical potato growers and home gardeners in the area, this program was extended to include over 200 acres of main-crop potatoes as well as garden plantings of early, mid-season and main-crop varieties. To minimize reproduction from overwintered adult flea beetles, volunteer potato plants growing in the newly seeded forage fields, previously planted to potatoes, were rogued or treated at least twice with carbaryl 80S or DDT 25 EC. Early in the growing season, visual observations were made at 10-day intervals to detect beetles or feeding damage on the potato foliage. Later, when the foliage was at least six inches high, beetles were detected by net-sweeping at 10-day intervals according to a designated sampling procedure. Methods of sampling were demonstrated at a field day. When beetle sampling indicated control treatment was necessary, DDT 25 EC was applied at the rate of 1.5 to 2 pounds of toxicant per acre, depending on foliage density. The number of foliar treatments of DDT 25 EC or carbaryl 80S for main-crop potatoes was reduced from seven or eight applied at 10-day intervals to three treatments, applied only when necessary in three fields, four in one field and five treatments in two fields.

At harvest, tuber samples from about half the acreage showed four fields with no economic damage from flea beetle larval feeding, one field with 1.9 per cent and one with 3.3 per cent damage. These results can be compared with 84 to 100 per cent unmarketable tubers in untreated plots in the same area during the previous three years.

The willing cooperation of potato growers and home gardeners in the Salmon River Valley has shown that a combined area control and beetle sampling program can be applied successfully against the tuber flea beetle. The British Columbia Department of Agriculture is planning to extend this program to two large potato growing areas in 1970. In all areas, DDT will be replaced with carbaryl 80S, 85 W.P. or 5 per cent dust at 1 to 1.33 pounds of toxicant per acre, depending on foliage density. Carbaryl, although more expensive and less persistent, is initially over five times more toxic to DDT-tolerant tuber flea beetles. ■

EXPLOSION OF AQUATIC GROWTH

J. R. ALLAN

Pendant de nombreuses années, l'homme a gaspillé ses ressources en eau par un usage inconsidéré et par la pollution. Le grand public vient juste de se rendre compte que cette richesse naturelle doit être protégée afin que les générations à venir puissent en profiter. La Station de recherches de Lethbridge, a mis en route un programme afin d'étudier la protection des plantes aquatiques par la combinaison de méthodes mécaniques, chimiques et biologiques. Les résultats de traitements chimiques sont décrits dans le présent article.

Aquatic plants have been on the increase for a number of years in Canada. They pose serious problems in the conservation, supply and drainage of water for agriculture, domestic and industrial use, transportation and recreation. The problems tend to be accentuated in countries like Canada because of extra run-off of agricultural and natural grasslands, from sewage effluent containing high quantities of detergents and soaps rich in water–soluble polyphosphates and from livestock feedlots where the run-off is rich in phosphates and nitrogen containing compounds.

In 1966, the Canada Department of Agriculture initiated an aquatic plant control program for western Canada through a combination of mechanical, chemical and biological methods. At the CDA Research Station, Lethbridge, we are using chemical herbicides to buy the time we need in order to learn how to manage the aquatic plants and other resources that influence our entire water-shed areas.

Since the beginning of the aquatic plant control program, collection trips in Saskatchewan and Alberta have revealed that the chief problem plants of our lakes and reservoirs are the *Potamogeton* species, Richardson pondweed, sago pondweed, white-stemmed pondweed, flat-stemmed pondweed, water milfoil (*Myriophyllum* sp.) and coontail (*Ceratophyllum* sp.). 'Scums' or algae-infestations are composed predominantly of *Spirogyra* and *Cladophora.* In the shallow ponds of the Nikka Yuko Centennial Gardens at Lethbridge, the fine-leaved pondweed, needle rush, and wapato have been found.

In treating lakes, it is important to remember that the chemical must be applied only when all the conditions are right. The control of aquatic plants requires just as precise selection of herbicide and of mode and time of application as the control of land weeds in cereal or vegetable crops. Since aquatic herbicides generally kill by contact, they must be placed close to the plants that are to be destroyed. Furthermore, it is desirable to have the herbicide persist in the water a minimum length of time so that the aquatic environment can return to its agricultural, industrial, or recreational use as soon as possible. We have obtained the best results using a mixture of diquat and paraquat applied at a rate of 0.5 to 1.0 part per million final concentration in the water. The herbicide diffuses throughout the test area and if it is injected beneath the surface of the water, diffusion outside the test area is minimal. At the above concentration, there has been no visible damage to fish, ducks, geese, gulls, swans or muskrats. The accompanying photograph shows a typical infestation of aquatic plants and algae on Henderson Lake opposite the Nikka Yuko Gardens in late June. The herbicide mixture was applied over the surface along the shoreline and injected beneath the surface in areas 2 feet or more in depth. The herbicide was diluted to 10 times the volume with water and applied by repeated criss-crossings of the test area to obtain uniform coverage. The 'after-treatment' photo shows the results obtained 17 days after herbicide application. The treated area is in the foreground and the untreated check in the background.

In the Nikka Yuko Centennial Gardens, very special problems exist. First, the Gardens have lawns extending down to the edge of the water in the pools. A contact herbicide might cause grass kill if wave

Dr. Allan is a plant physiologist at the CDA Research Station, Lethbridge, Alta.

Before (left) and after (right) treatment for control of aquatic plants shown at Henderson Lake, Lethbridge, Alberta.

action washed it up on the shore. Second, ornamental shrubs are planted within 5 to 10 feet of the shoreline and their roots are undoubtedly very close to the water or extend into the pool beds. Third, the pools are stocked with trout, therefore, the herbicide must not be persistent or toxic in the water. Last, swans are summered in the pools and the herbicide consequently must exhibit a very low solubility in the water to be harmless to the birds. In this situation, we used granules of dichlobenil applied to the dry pool-beds in early spring. The granules were spread right up to the edge of the grassed banks. Spring rains normally would soak the herbicide into the soil of the pool bed but, to ensure that moisture was adequate, lawn sprinklers were used to soak the entire area. Because of its low solubility in water, dichlobenil, once it was fixed in the soil, displayed very little lateral movement within the soil or back into the water. Throughout the summer season, the pool remained free of rooted aquatic plants. No damage to lawns, shrubs, fish, or swans appeared nor to water lilies rooted in plastic tubs and placed in the pools.

The above examples suggest that we may have a means of temporary control of aquatic plants on some of our lakes, reservoirs, and ornamental gardens. Before complete management of our aquatic environment can be attained, extensive research will need to be done on the interactions between water composition, seasonal water temperature, and light conditions found at various aquatic sites, and the individual aquatic plant species that grow at each site. This research has been initiated and the first results are beginning to come in. It now seems entirely reasonable to assume that the physical and chemical attributes of individual lakes determine the species of aquatic plants that will grow there.

In nature, aquatic plants live in balance with each other, with the fish, ducks, gulls, aquatic mammals, and other aquatic organisms. But with the advance of civilization, man has upset this balance. Increasing amounts of chemicals that are necessary for aquatic plant growth have reached some of our lakes causing specific plant species to grow luxuriantly. Other aquatic plant entering the aquatic ecosystem accelerates that growth even more. Uncontrolled plant growth disrupts the oxygen balance and coarse fish replace the desirable game fish. The delicate balance that originally existed is upset even further. The cost of restoring our water to clarity and usability will be great, but Man must judge the worth of clear water not only in terms of real value but in terms of the aesthetic value to our present and future generation.

The major part of the aquatic plant control program at Lethbridge is the examination of the physical and chemical make-up of various aquatic ecosystems. We are establishing sensing stations to determine yearly fluctuations in light and temperature. Complete chemical analyses will be made every two weeks to determine the water composition at a dozen or more sites. This data will be programmed for computer analysis. A second part of the program is concerned with the biochemical analysis of aquatic plant species to determine their possible nutritive value to livestock and possibly even to human beings. If we are going to use the extra plant nutrients that reach our water supplies, we must know exactly what aquatic 'crops' should be planted to be most beneficial to mankind. The third part of our program is concerned with research studies on biological, chemical, and mechanical methods of aquatic plant control.

The most satisfactory method of control of the aquatic plants is a combination of biological, chemical and mechanical methods. Chemical control procedures were described at the beginning of this article. Assessment of the selectivity of herbicides for specific aquatic plants is progressing. As new chemicals become available they will be tested. Studies have been started on biological agents which might control plants as well as provide improved recreational prospects. We have shown that a degree of temporary control has already been obtained with chemical methods. There is no good reason why we cannot enjoy the high affluence that exists in Canada today and still leave aquatic environments for future generations to enjoy. ■

BREAKDOWN IN SPARTAN APPLES

J. MASON

Le blettissement des pommes Spartan est un grave problème d'entreposage au froid. Ce problème se répète lorsque l'arbre est mis en carence de calcium. Le présent travail met en évidence la déficience de calcium comme cause du blettissement.

The problem of breakdown in Spartan apples, a variety developed at Summerland, is a serious one for the fruit industry. Wholesalers who may receive a few isolated breakdown fruits in shipments will shy away from further orders.

Spartan apples grow well under our Okanagan Valley growing conditions. They pack out to 80 to 95 per cent Extra Fancy grade, ensuring maximum dollar returns for growers. The red skin color has customer eye-appeal; the crispness and good flavor is popular and the tough skin resists commercial handling.

Spartan breakdown, a periodic storage disorder, is rarely present at harvest time but only develops after some time in storage, during shipment or at the point-of-sale storage. For this reason growers of Spartan, for the most part, never see breakdown in their fruit and may not fully appreciate the seriousness of the problem.

The disorder has been sporadic in the Okanagan Valley. Six to ten years may pass with very little breakdown occurring, followed by one year with a serious percentage of breakdown in some fruit lots. The reason for this cycle has not been discovered. It would appear to be a climatic factor, but attempts to relate climatic factors to years of high breakdown incidence have not been successful so far. By finding the cause of the breakdown it was considered that this year-to-year fluctuation may be more easily identified.

In experiments at the CDA Research Station, Summerland, we have shown that Spartan breakdown can be caused by calcium deficiency.

The findings were obtained in the 1968 growing season from stored-fruit produced from trees grown in silica sand cultures, fed only by nutrient solutions. The silica sand was placed in concrete pots painted with asphalt. Trees were planted in the pots. Nutrients were supplied in the water used. In this way, the amount of nutrients supplied to the trees could be varied as the experimenter wished.

The solutions supplied to the trees were identical in nutrient content and concentration except for cal-

The Spartan trees were grown in silica sand in these concrete pots. An automatic system for supplying nutrient solutions was developed using polyethylene pipe.

Dr. Mason is head, Soil Science Service, CDA Research Station, Summerland, B.C.

cium. The calcium supply was varied from full nutrient supply to one-half, one-quarter and one-eighth the full amount.

At the end of the cold-storage season in April 1969, the fruit from the trees receiving the full supply of calcium had only 2.5 per cent breakdown, the one-half treatment had 11 per cent, the one-quarter treatment had 30 per cent and the one-eighth treatment had 46 per cent. These findings constitute clear evidence that the reduced calcium supply to the trees can cause breakdown in Spartan apples.

Now that it has been shown breakdown can be caused by calcium deficiency, research work can proceed on methods of increasing the calcium content of the fruits in the orchard. This should produce more useful information. Formerly, experimentation did not produce useful results because little or no breakdwon occurred in many years, but now the calcium content of the fruit as well as the incidence of breakdown can be studied every year.

The finding that Spartan breakdown can be caused by calcium deficiency comes as a bit of a surprise to many people. It has been assumed in past years that because the soils of the Okanagan have free lime in the soil at some depth, the calcium nutrition of the tree must be in good shape. However, the availability of calcium to the tree is affected by many factors including the balance of calcium with potassium and magnesium.

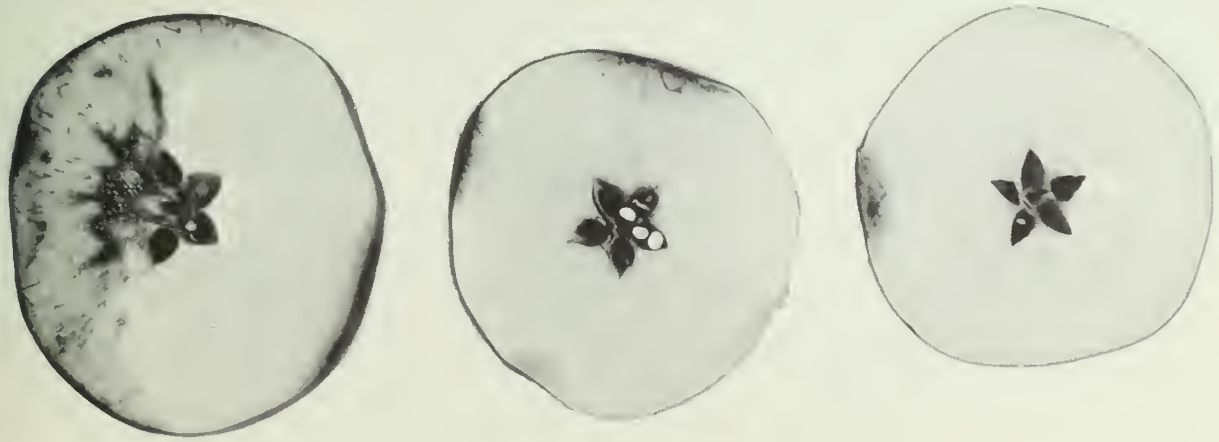
The clue which led to the investigation of calcium arose from a series of 21 spray experiments carried out to investigate the effect of calcium nitrate sprays on apple firmness in 1965. Three of these experiments were on Spartan. The fruits in storage from these three experiments developed breakdown. The fruits were analyzed for calcium. The experiment with the highest breakdown, 39 per cent, had the lowest calcium content and the experiment with the lowest breakdown, 4 per cent, had the highest calcium content.

The fruits from one orchard or one tree will vary quite a bit in their calcium content. If the calcium content of individual fruits is low enough, breakdown in those fruits will occur. It can be understood, therefore, that if the general level of calcium is a little lower in one growing season, then the number of apples with low calcium content will increase and the percentage of breakdown will also increase, perhaps from 1 per cent to 10 per cent. The aim of corrective treatments will be to raise the general level of the calcium content of the fruits so that no one fruit develops breakdown because of its low calcium content.

A considerable reduction in the amount of breakdown was achieved from the calcium sprays in the three experiments. The improvement in the sprayed treatments was from 4.4 to 0, from 30 to 11 and from 39 to 8 per cent of fruits showing breakdown. The sprays applied were dilute sprays of 0.8 per cent calcium nitrate plus spreader. This work indicates that considerable reduction in per cent breakdown can be expected from calcium sprays but, so far, complete elimination of breakdown has not been achieved.

Dilute sprays are no longer used to any extent commercially in B.C. Because of this, work has been done to develop concentrate spray methods, but the changes caused in the calcium content of the fruit have not yet been worked out. Calcium nitrate does burn the foliage at strong concentrations and growers should spray only one or two trees if experimenting with calcium nitrate in their concentrate sprayers.

An extensive experimental program is to be carried out in the summer of 1970 to test the effectiveness of calcium nitrate and calcium chloride in concentrate sprayers. Breakdown percentage and calcium concentration in fruits will be used to measure effectiveness. ■



Three Spartan apples showing severe, moderate and mild breakdown. The disorder starts at the skin of the apple.

Cover: The Canadian Farm Management Data System (CANFARM)—see article page 10—is a joint federal-provincial-university farm management service. This service provides a major portion of the information required for the profitable development of Canadian farms. The success of this service depends very heavily on the work of the farm management extension specialists of the Provincial Departments of Agriculture.

Photo couverture: Le CANFARM, système national de comptabilité agricole (voir article page 10), est le fruit de l'effort combiné des universités, des gouvernements provinciaux et du gouvernement fédéral. Ce service de gestion fournit aux agriculteurs la plupart des renseignements dont ils ont besoin pour rendre leur entreprise rentable. Les vulgarisateurs provinciaux par leur travail et leur dévouement feront de ce service un succès ou un échec.

CANADA
AGRICULTURE