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Drift hazards from the large-scale use of herbicides are under investigation by Agriculture Canada scientists. See story on page 20.

Les dangers de dérive lors de l'usage extensif des pesticides font l'objet d'études par les chercheurs d'Agriculture Canada. Voir texte en page 20.

CANADA AGRICULTURE

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

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Agriculture Canada

ROP—THE KEY TO EFFICIENT BEEF PRODUCTION

W. A. GILLIS

Par le Contrôle d'aptitudes, la Division des bestiaux du ministère de l'Agriculture du Canada a mis au point un programme d'évaluation des bovins de boucherie qui permettra une amélioration génétique rapide du secteur canadien des bovins reproducteurs. Le fait que le nombre d'éleveurs participants au programme de contrôle d'aptitudes se soit multiplié par 12 au cours de la dernière décennie montre bien l'intérêt croissant des producteurs pour l'amélioration génétique.

With the infusion of many new breeds into the Canadian population, there is an increasing awareness of the importance of performance testing

In the past decade, few other industries of equal size and scope have changed more in the basic concepts of production, processing and the nature of the product than the Canadian beef cattle industry. The infusion of new breeds, increased use of artificial insemination, changes in consumer demand for leaner beef, and more competition among beef producers have brought the concept of performance testing to the forefront of the industry. Increased recognition of the importance of the national Record of Performance program (R.O.P.), which was initiated in 1956, and advanced statistical methodology has led to a significantly larger and more sophisticated system of genetic evaluation.

The objective of a national performance testing program is to genetically improve the population for traits of greatest economic importance. Performance testing is a mechanism that distinguishes genetic differences among animals by measuring the performance of an individual or an individual's offspring. In the former case, genetic differences are identified by the relative difference of the individual's performance compared with its contemporaries. In the latter case, an individual is evaluated genetically by the performance of its progeny compared with progeny of other bulls or cows. The individual performance test is generally favored for traits that can be easily measured and have relatively high heritability. The individual performance test also allows more rapid genetic evaluation. The progeny test is useful for the evaluation of imported or other untested bulls and of traits of low heritability.

The national R.O.P. Program for Beef Cattle encompasses three levels of testing: (1) home testing; (2) station testing of bulls; and (3) progeny testing. It is a federal—provincial program with the federal government assuming responsibility for national coordination and data processing. The provincial governments are responsible for the actual mechanics of administering the program and for subsequent extension activity. The overall governing body of the R.O.P. program is the National Advisory Board. This Board is comprised of federal and provincial government personnel, purebred and commercial producers, researchers and representatives from other segments of the beef cattle industry such as the meat packing industry.

Home Testing

The home test is a performance test of animals in a producer's herd. This program provides producers with an objective basis for within herd selection of both male and female breeding stock. In smaller herds, it pertains primarily to the selection of females, as male selection is much more limited.

Dr W A Gillis is Head of Beef Cattle Production, Livestock Division, Production and Marketing Branch, CDA, Ottawa

The traits that are recorded and evaluated on the home test program are as follows:

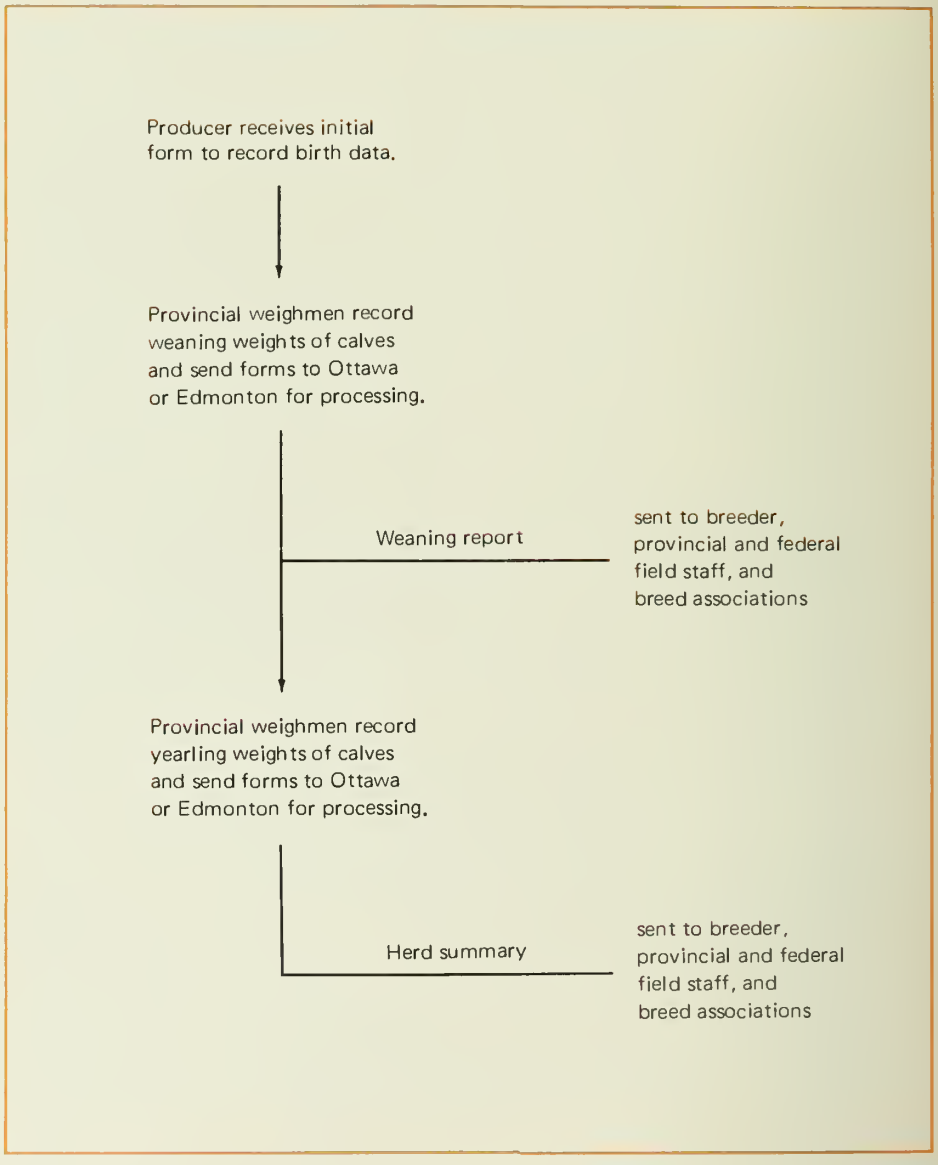
Maternal and Reproductive Traits
- calving interval
- gestation period
- cow defects
- calving ease
- calf condition at birth

Growth Traits
- birth weight
- adjusted 200 day weight
- average daily gain (birth to weaning)
- average daily gain (on 165 day feeding period)
- adjusted 365 day weight

The home test program includes evaluations of both maternal and reproductive traits, and growth traits. Growth traits are the most useful in a performance test due to high heritability and accuracy of measuring the traits. The maternal and reproductive traits are the most important in commercial beef production, but do not respond well to selection and are difficult to quantitate. However, they enable producers to improve management practices and are extremely important for progeny testing of A.I. Sires.

The flow chart (right) illustrates how the program operates.

The breeder receives two processed reports—a Weaning Report and a Herd Summary. All reports contain summarized data for each individual animal, each sex-group of animals, and each herd sire. These records provide the necessary data to assist producers in making selection decisions. In addition, upon request a "Cow Production Certificate" that includes the records of a particular cow's progeny is provided. This certificate is especially useful for culling unproductive cows in the herd. The producer also receives an



annual report on all cattle tested under the program.

In the 1973-74 test year, approximately 113,000 calves were tested in over 3,000 herds. The program has grown by about 1268 percent over the past 10 years, with the most growth in the past 5 years.

Station Testing

Centralized station testing of bulls allows the determination of genetic differences in growth rate under a rigidly controlled feeding and management situation. Station testing also allows accurate genetic evaluation among large contemporary groups of bulls from many herds and sires. Combined with the standardization of feeding and management, producers can purchase these bulls with confidence. A superior performing bull in a test station is more likely to improve a herd than one purchased out of a small tested herd, as the latter test is based on smaller numbers and does not evaluate bulls across herds under the same environmental conditions.

To evaluate average daily gain, bulls' weights are recorded over a 140-day feeding period

Bulls are placed in stations when weaned at about 200 days of age. They are then given a 28 day warm-up period to adapt to their new environment before being tested over a 140-day feeding period. Average daily gain is the only trait evaluated as it is devoid of pre-weaning influences.

The 14 stations in Canada tested over 2,000 bulls in the 1973-74 test year. Station operation and data processing are carried out at the provincial level. Each station is governed by the provincial R.O.P Advisory Committee, which also advises the National Advisory Board.

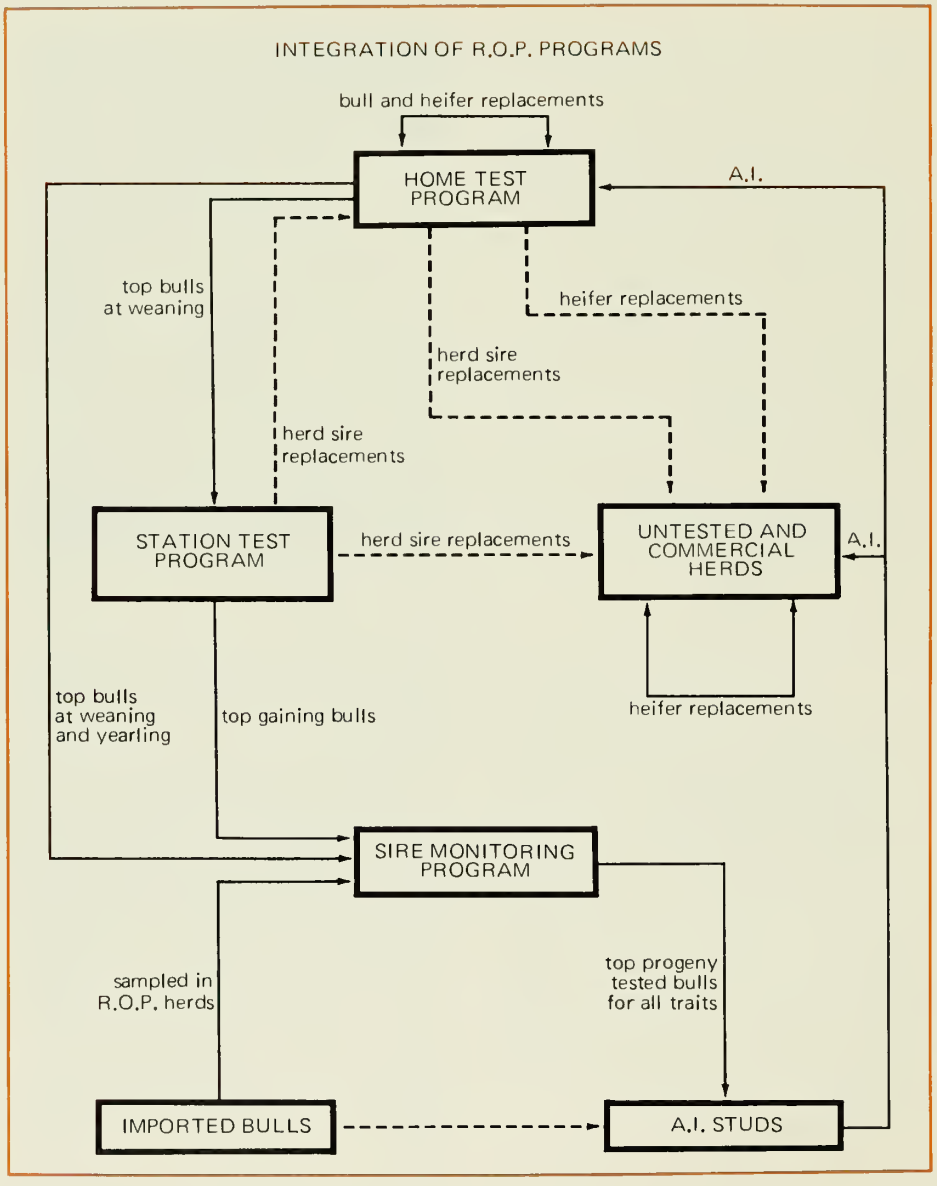
Progeny Testing

Progeny testing enables producers to evaluate the genetic potential of a bull or cow based on progeny performance. It is particularly useful for evaluating mature, unproven, imported bulls for carcass traits and traits of low heritability such as the various maternal and reproductive traits. Progeny testing is the most accurate type of test providing there are sufficient numbers of progeny. However, it is also more expensive and time-consuming. Progeny testing of young, performance-tested bulls allows optimum genetic evaluation.

In November of 1974, Agriculture Canada announced a new program called "The National Sire Monitoring Program". Under this progeny-testing program, performance data is collected on sires used in R.O.P. herds on a continual basis. Because data is collected, on a large number of progeny, many sires can accurately be evaluated. This applies primarily to A.I. bulls. Again, the objective of this program is to routinely evaluate widely used beef sires and to provide a means for producers to progeny test individual bulls in an inexpensive, accurate and rapid manner.

Semen from A I bulls is stored in nitrogen tanks

The advent of this program has been a "Canadian first". No other beef sire appraisal program employs these advanced statistical procedures. The "Direct Sire Comparison Procedure" employs a statistical technique known as "best linear unbiased prediction (B.L.U.P.)" procedures. This allows a relatively large proportion of the non-genetic variation associated with a bull's performance in a particular trait to be identified, yielding an accurate genetic evaluation of that trait. Most animal geneticists consider this statistical procedure superior to other procedures in use. It is the only beef sire appraisal program that employs this procedure and is a classic example of putting theory into practice. This procedure was implemented through the cooperative effort of staff at the University of Guelph and Agriculture Canada, and under the direction of the R.O.P Beef Technical Committee.



WEANING WEIGHT PROOF (BREED—CHAROLAIS)

Reg. no.	Name	No. of herds	No. of males	No. of females	Predicted difference	Standard error of prediction
FMC 228	Domino	9	40	45	+45	± 9
FMC 122	Cadet-Roussel	82	144	179	+25	± 4
FMC 108	Camarade	20	22	29	— 8	± 8

For an A.I. unit or producer to participate in this program, there are several guidelines:

- Bulls must be sampled in 5 or more R.O.P. herds.
- The bull must have at least 50 progeny in total.
- Two sires in each herd must be used—one the test sire and the other a well-known, widely-used sire. This is necessary to ensure that all herds and sires are directly or indirectly "connected" to each other.
- Random mating must be used.
- Accurate and complete records must be kept.

The above guidelines ensure an accurate progeny proof on a sire with little cost and in a short period of time.

To date, 968 bulls have been evaluated under this program. Of these, 118 have been publicly listed as proven. They were evaluated for weaning weight, gain on feed and yearling weight. Eventually, they'll also be evaluated for calving ease and carcass merit allowing a comprehensive evaluation of bulls for traits of greatest economic importance.

Integration of R.O.P. Programs

The three levels of testing are part of an overall testing scheme for Canada, and are integrated to provide optimum selection in the Canadian beef population.

It is an opportune time for increasing beef cattle performance testing. With the infusion of many new breeds into the Canadian population, and an increasing awareness of the importance of "performance" in beef cattle production, it is now a question of getting on with the job. The Livestock Division's objective is to develop, promote and carry out a beef cattle testing program that will rapidly improve the Canadian seedstock industry. ■

PLANT RESPONSES TO NORTHERN ENVIRONMENTS

R. E. HARRIS

À plusieurs égards, le climat agricole de la région de la Rivière-de-la-Paix l'emporte sur celui des Prairies du sud. Toutefois, beaucoup de plantes ne s'adaptent pas à l'environnement du nord du fait qu'elles ont été créées en fonction d'une longueur du jour différente ou de climats à températures plus élevées et saisons de croissance plus longues. Les chercheurs de la Station de recherche de Beaverlodge pensent qu'il faut employer de nouveaux régimes d'exploitation et de nouveaux cultivars particulièrement mis au point en fonction des conditions du Nord pour accroître la production.

Because of its northerly location (55°13'N latitude), most Canadians expect the Peace River region to have a much less favorable climate than the southern prairies. Reports of difficult harvesting seasons, a short frost-free season and lower summer temperatures, and theories on plant-climate relationships based on more southerly findings indicate a rather low agricultural potential for this region. Results obtained at the Beaverlodge Research Station suggest that this is not a true picture of the situation. Furthermore, many of the results point to an even greater potential than is presently realized.

The Peace River region is large, with an area roughly equivalent to the entire agricultural area of Manitoba (See map). It is no surprise, therefore, that in many years one part of the region may suffer adverse weather conditions. However, adverse conditions rarely occur over the whole region in any one year.

In many respects, the agro-climate of the Peace is superior to the southern prairies. This is reflected in higher yields of cereals (see table), higher content and better quality of oil in seeds, and better survival of herbaceous perennials. Some of the superior aspects of the agro-climate of the Peace compared to that of the southern prairies are as follows:

- long days resulting in more hours of light during the killing-frost-free period (—2.2° C).
- higher precipitation (except at Morden).
- less wind and lower evaporation resulting in a lower moisture deficit.
- higher soil temperature during the winter.
- higher mean air temperatures during the three coldest months of the year.
- fewer degree-days required to ripen crops.

A COMPARISON OF THE AGRICULTURAL AREAS OF MANITOBA AND THE PEACE RIVER REGION

Crop Response

However, the superiority of one climate over another is not important. What is important is how crops respond to differences in the environment.

Many plants do not respond to the environment according to some generally held beliefs:

- short day plants, such as onions, develop normally in long days.
- minimum temperatures during the winter are not the primary cause of winter injury in woody plants.
- the cool fall temperatures do not result in early hardening.
- tomatoes do set fruit during the day, and even in continuous light.
- the earliest maturing crops on the southern prairies are not always the earliest in the North.

Some of the reasons for these differences in response are partially understood, but many are still the subject of considerable speculation. There can be little doubt that a great part of the problem is that most of the plants grown in the North were developed for warmer, entirely different climates.

Short growing seasons and low temperatures are often blamed for the poor performance of a crop. Although it is often said that little can be done to lengthen the growing season, poor crop performance is often caused by more specific factors that can be modified.

For example, on heavy textured soils in the Peace River region sweet corn matures, on the average, only 1 year in 7, and bush beans also usually produce poor crops. The major factor limiting the production of both crops is low soil temperature in spring. This limiting factor can be overcome with clear polyethylene mulches. With mulches, the reliability of corn production is increased to 9 years out of 10 and good crops of beans can be produced

Dr Harris is Head, Environment and Special Crops section, CDA Research Station, Beaverlodge, Alberta

Contender beans grown in polyethylene mulch

Contender bush beans with and without polyethylene mulch.

every year. The factor limiting sweet corn production in the 10th year is the inability of cultivars developed for warmer climates to mature beyond the milk stage at low temperatures. A cursory examination of a few genotypes showed that at least one of the 'less improved' cultivars did mature at lower temperatures than any of the others tested. By breeding it should be possible to transfer this ability to mature at low temperatures to other cultivars. A similar approach has been used to improve the reliability of tomato and strawberry production in the Peace River region.

COMPARISON OF SOME ENVIRONMENTAL FACTORS AT BEAVERLODGE (55°13'N), MORDEN (49°11'N) AND SWIFT CURRENT (50°24'N).

		Beaver-lodge	Morden	Swift Current
Ave. yield from exp. plots				
Marquis wheat (1967-73)	q/ha	30.8	22.2	13.5
Victory oats (1968-73)	q/ha	35.8[1]	34.4	19.0
Conquest barley (1967-73)	q/ha	41.4[2]	37.0	13.1
No. hours of light between date of last and first killing frost (—2.2° C)		2406	2366	2236
Wind-mean daily	k/hr	12.6	N.A.[3]	24.8
Precipitation, May—August mean	cm	23.1	26.9	19.0
Potential evaporation mean yearly	cm	47.0	65.0	73.2
mean May 1—Aug. 31	cm	37.8	48.5	51.8
Soil temperature—Jan. mean	C	— 3.8	— 5[4]	— 9.2
—lowest recorded	C	—10.6	—15[4]	—19.4
Air temperature				
Mean of 3 coldest months	C	— 9.8	—13.8	—11.3
Degree-days to ripen Thatcher wheat		1783	2041	2008

[1]1971-73 only
[2]1970-73 only
[3]Not available
[4]Not available for Morden. Glenlea Research Station data used instead.

Climatic Factors

At present, production and weather records are being studied to identify factors limiting wheat production in the Peace River region. Between 1934 and 1954 Thatcher wheat required an average of 103 days to ripen at Swift Current and 121 days at Beaverlodge. Wheat at Beaverlodge took 5 days longer to reach the heading stage and most of the difference occurred between seeding and emergence. However, the stage from heading to ripe took 13 days longer at Beaverlodge. Weather records show that during this stage precipitation is lower, and wind, temperature (air and soil), evaporation, and hours of sunshine are higher at Swift Current than at Beaverlodge.

Similarly, in the 6 earliest ripening years at Beaverlodge, the average precipitation was lower, while average wind, evaporation, hours of sunshine, and air and soil temperatures were higher than for the 6 latest ripening years. Thus, low precipitation, high wind, evaporation, air and soil temperatures, and long hours of sunshine appear to promote early ripening.

A number of the above climatic factors, however, are interdependent. A

comparison of the climate of each early ripening year with each late ripening year revealed only one consistent difference in climate between late and early ripening years. In the early ripening years, daily maximum temperatures during the 6 weeks before ripening were consistently higher than in the late years.

New Cultivars Required

The long term solution is to breed cultivars with the ability to ripen at lower temperatures, but first the genotypes with this ability must be identified. Since most cultivars were developed for warmer climates, the genetic potential for ripening at lower temperatures has probably been reduced, or even eliminated. It may, therefore, be necessary to go back to more primitive cultivars or even collect wild types from regions with cool ripening weather to provide the genetic potential from which to breed new cultivars for the North.

If the agricultural production potentials of the Peace and other northern regions are to be achieved, a much greater effort must be made:

- to determine the major specific factors limiting plant development.
- to identify genotypes less affected by these limiting factors, and
- to breed new high performance cultivars better adapted to the combinations of environmental factors encountered in the North.

If Canada is getting colder, as many meteorologists suspect, the development of new concepts, management practices, and cultivars specifically for 'far' northern conditions is not only necessary for a productive agriculture in the North, but also may be vital for a continuing Canadian agriculture. ■

A MODIFIED CONTROL PROGRAM FOR CARROT INSECTS

A. B. STEVENSON

En étudiant le cycle biologique de la mouche de la carotte, les chercheurs de la Station de recherche de Vineland ont mis au point des calendriers de pulvérisation qui ont permis de combattre efficacement ce ravageur et de réduire les quantités d'antiparasitaires nécessaires.

In recent years, research and the furor over pesticides has forced all concerned with pest control to evaluate insecticide use. Agricultural producers know that pesticides are essential to successful crop growth. Wiser use of pesticides will not only reduce pressure on the environment, but also will save farmers money, and perhaps provide more effective pest control.

With this in mind, a program was established at the Vineland Research Station to study the control of insects affecting carrots in the Holland Marsh, and to more effectively use insecticides on this $6 million crop. Problems associated with pesticide use are particularly important in this 7,000-acre "market garden" where more than 350 farms primarily produce vegetables. About 75 percent of the carrots produced in Ontario are grown in the Holland Marsh.

Carrot growers in the marsh must deal with 3 major insect pests: the carrot rust fly and carrot weevil, which tunnel in the carrot roots in their larval stages; and the aster leafhopper which transmits the "aster yellows" disease. More pesticide is applied annually for control of carrot rust fly than for other insects.

The carrot rust fly has two gener-

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ations a year in the Holland Marsh, and sometimes a partial third generation in late autumn. Experiments conducted on the marsh and elsewhere showed that the first generation can be controlled by the use of carbofuran granules applied in the seed furrow at planting. As this treatment also appears effective for control of the carrot weevil and leafhoppers, it appears likely that this single insecticide application will control the main insect pests until the second generation rust fly appears near the end of July. Spraying with either parathion or diazinon is the only known method of effectively controlling the second generation flies.

The second generation flies usually persist for about 2 months, requiring up to eight sprays to prevent damage. However, the levels of rust fly attack vary widely throughout the Marsh, requiring fewer sprays on some farms than others. To help time these sprays more effectively, a monitoring program for rust fly adults was set up. Cages were placed on sites infested by the preceding generation to determine the times and peaks of adult emergence. Simple sticky traps were designed to monitor the activity of rust fly adults on individual farms. The information obtained was used to make general recommendations for the area.

Spray schedules based on information obtained by monitoring plots proved very effective against second generation rust fly in both 1973 and 1974. In 1973, on plots on six farms, the number of sprays required ranged from two to five, and averaged 3.3. The rust fly injury on carrots from these plots ranged from 0 to 9 percent and averaged 2.3 percent, an acceptable level of damage. In 1974, four plots were monitored, and zero, zero, one, and two sprays were recommended, respectively. However, the first two plots were each sprayed once in error. The average damage at harvest was 4 percent, but most of this injury was not serious enough to make the carrots unmarketable.

The prospects for reducing the amount of insecticide on carrots appear very bright. The control program for insects, however, must be integrated with controls for foliar diseases. Research on improved timing of sprays for these diseases is currently being carried out in the Holland Marsh by personnel from the University of Guelph. As information becomes available, the amount of pesticides used in carrot production will be reduced appreciably. ■

Insect damage can cause serious economic losses to producers: on the left are two healthy carrots; the centre two carrots have been damaged by the carrot weevil, the two carrots on the right have been damaged by the carrot rust fly

BRUCELLOSIS CONTROL IN CANADA

G. McKEOWN

Depuis 1950, la Direction de l'hygiène vétérinaire a mis sur pied plusieurs programmes dans le cadre d'une série d'étapes destinées à enrayer et, éventuellement, à éliminer la brucellose au Canada. Grâce à la collaboration des éleveurs, la Direction a la conviction de pouvoir enrayer complètement cette maladie.

Brucellosis is a contagious, costly, livestock disease that also affects humans. Although the disease can attack other farm animals, it is primarily a threat to cattle.

Abortion is the most outstanding symptom of the disease in cattle. This usually occurs between the 5th and 7th month of pregnancy. A common sequel to abortion is retention of the placenta with resulting uterine infection. Milk production may be reduced approximately 25 percent due to changes in normal lactation period caused by abortions and delayed conception.

Control Programs

The first steps towards eradication of brucellosis in Canada were taken in 1950 with the establishment of the Federal-Provincial Calfhood Vaccination Program. Under this program, over 10 million calves were vaccinated. As a mass control measure, vaccination reduced the level of infection in the cattle population from 9 percent in 1950 to 4.5 percent by 1956. The next step towards eradication was the introduction of the test and slaughter policy.

The national test and slaughter program began in 1957 under federal legislation. By 1966, all areas in Canada had been tested and, where necessary, retested to reduce the level of infection to below 0.2 percent. Under this program, testing is compulsory and reactors are ordered slaughtered with compensation to owners paid by Agriculture Canada.

Towards the end of the first general test, the Health of Animals Branch introduced two screening procedures, the Market Cattle Testing and the Brucellosis Milk Ring Testing programs, to monitor the presence of infection and reduce farm testing. Under the Market Cattle Testing Program, cows destined for slaughter are identified at assembly points by a coded backtag. Federal inspectors collect blood samples from the backtagged animals at the time of slaughter and forward them to a federal laboratory for testing. Negative results are credited to the owner's herd. But when a reaction is uncovered, the herd of origin is submitted to a blood test.

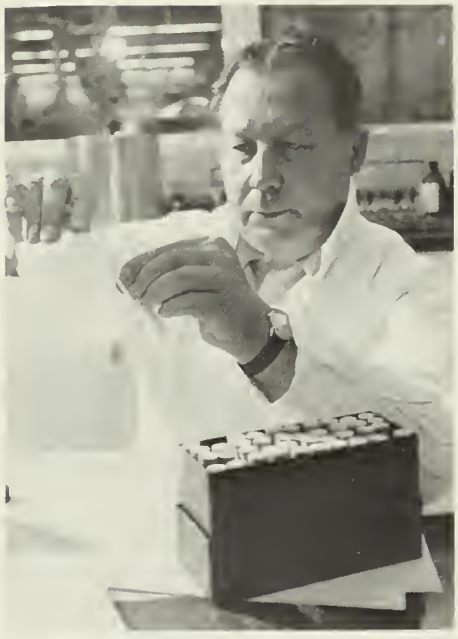
Under the Brucellosis Milk Ring Testing program, Health of Animals Branch inspectors collect milk and cream samples four times a year at a receiving depot from herds shipping milk or cream. Negative results indicate that a herd is free from brucellosis. Where a reaction is found, the owner's herd is blood tested.

Towards Total Elimination

The Health of Animals Branch feels that there has been undue reliance on vaccination to provide protection against brucellosis. Scientific evidence indicates that under usual field conditions, the vaccine protects about 60 to 65 percent of the animals vaccinated, although this percentage is reduced where there is a massive exposure.

A Health of Animals veterinarian extracts a blood sample for testing for brucellosis.

Dr G McKeown is Chief of Eradication Programs, Health of Animals Branch, Agriculture Canada, Ottawa



Health of Animals Branch inspectors collect milk and cream samples at dairies for testing under the Brucellosis Milk Ring Testing Program

calfhood vaccination has been de-emphasized and not eliminated. Ultimately, it will be necessary to take this step to achieve complete eradication.

During the last two years, there has been some increase in the incidence of brucellosis. As of March 15, 1975, there was a low level of infection in the Altantic provinces and also in Alberta and British Columbia. In the four Atlantic provinces there were 3 quarantined herds, in British Columbia 8 herds, and in Alberta 19 herds. In Saskatchewan the number of quarantined herds was 68, in Manitoba 58, in Quebec 140, and in Ontario 418.

The Health of Animals Branch has carefully reviewed all aspects of its brucellosis eradication program and has concluded that some modifications were necessary to achieve complete eradication. These include testing of cattle at auction markets, less tolerance on the interpretation of the milk ring test, maintaining infected herds under quarantine until they have passed two negative tests, and depopulation of some herds where the disease cannot be readily eliminated by testing procedures and other control measures. The Branch has also stressed the need for immediate removal of reactors, prompt cleaning and disinfection of the premises as well as a prompt retest of all infected herds.

In most cases, herds become infected when an owner unknowingly buys a brucellosis infected animal. Owners have a responsibility to take precautions to keep their herds free from brucellosis and one of the most important safeguards is to purchase only brucellosis negative cattle.

The Health of Animals Branch is confident that with continued diligence and cooperation from the livestock owners we will achieve our goal of complete eradication of brucellosis. ■

The fact that it is not possible on the laboratory tests to differentiate between reactions due to vaccination and those due to natural infection has resulted in the masking of the infection in some vaccinated animals with the perpetuation of the disease in those herds where this occurs.

Recognizing that total eradication of brucellosis could not be accomplished in conjunction with mass calfhood vaccination, and with the national infection rate below 2/10 of 1 percent, the Health of Animals Branch began deemphasizing vaccination a few years ago. Because fewer calves were being vaccinated, there was an increase in the number of totally susceptible cattle and an increase in the disease where there was residual infection. The sequence of events was anticipated at the outset. For this reason, brucellosis

A veterinarian discusses a brucellosis control program with a farmer

A WEED IDENTIFICATION GARDEN

A. S. HAMILL

Le jardin d'identification des mauvaises herbes, établi en 1972 à la Station de recherche de Harrow, a pour but d'aider les agriculteurs et les citadins à identifier les espèces de mauvaises herbes et à étudier leur mode de croissance. Les chercheurs pourront alors faire de meilleures recommandations sur le désherbage puisque les espèces de mauvaises herbes auront déjà été identifiées par l'agriculteur.

"Hello" . . .
"Yes, speaking" . . .
"You have a small weed with sharp notches for indentations on the edges of the leaf growing in your cabbage field" . . .
"It is very hard to kill" . . .
"It also has small yellow flowers on it" . . .
"Last year there was some in your tomato field, but you had never seen it before then" . . .
"You asked your neighbor the name of the weed and he said around here it is called 'Summer weed' " . . .
"What is the proper name and what can you do to control it?"

This type of telephone conversation has occurred often at the Harrow Research Station. In addition, many weed specimens have been brought to the station or arrived by mail for possible identification. Sometimes the plants have arrived in good conditions, but frequently they are dried up, crinkled, moldy specimens.

Farmers and urban dwellers alike have weeds which they cannot identify. Farmers have traditionally preferred to have their problem weeds identified by a specialist visiting the farm so that he can discuss suggested control measures. The large number of herbicides available at present has led to increased specialized uses. Many herbicide container labels now specify the weeds which can be controlled and sometimes those which cannot be controlled. The high agricultural productivity of southern Ontario makes it imperative that farmers properly identify the weeds in their crops to obtain maximum effectiveness from their investment in herbicides.

A survey conducted in the fall of 1971 in Essex, Kent and Lambton counties of Ontario indicated that only 15 percent of the farmers could identify the 28 most common weeds in the region. This situation gave rise to the concept of establishing a weed garden at Harrow which always would be available for public viewing and study.

The weed identification garden established at Harrow in 1972, was designed to allow each weed species to occupy a plot 60 by 60 cm with a 60 cm grass border between plots. The garden consists of three tiers of 40 species each, for a total of 120 plots. The species are divided into three groups on the basis of their life cycles—annuals, biennials, and perennials. A further division, where possible, concentrated on grasses in one area and broadleaved weeds in another. Tallest growing species were planted in the third tier, and lower growing plants in the front tier. As an aid to maintenance each plot was surrounded with a plastic lawn strip to prevent grass encroaching on the seeded area. Plot labels indicate both the scientific and common names. Special provision was required for weeds with creeping root systems. These were planted in tiles 90 cm long and 30 cm in diameter placed upright in the ground. All species are allowed to propagate sufficiently to occupy the plot areas.

Dr. Hamill is a weed ecologist at the CDA Research Station, Harrow, Ontario

The Harrow weed identification garden is divided into three sections based on the life cycles of the weeds—annuals, biennials and perennials

Weeds with creeping root systems are planted in tiles to prevent their spread to surrounding areas

The weed garden has served as an excellent aid to farmers and city dwellers for identification of weed species and the study of their growth habits. Farmers use it to obtain correct identification of their problem weeds before requesting information on control measures.

To the research scientists, the garden has provided the opportunity to devote more time to basic research projects and less time to weed identification and extension activities. When extension information is requested, the scientist is able to quickly offer better weed control recommendations since the weed species have been previously identified by the farmer. As an added benefit, the garden has provided research data on the germination and growth habits of various weed species. For example, fall panicum *(Panicum dichotomiflorum Michx.)* has long been considered a late germinating grass, particularly in atrazine-treated corn fields. In the weed garden, the germination time of fall panicum has been similar to other annual grasses, indicating partial control from atrazine treatment or a prolonged germination period.

The establishment and maintenance of the weed identification garden has not been without problems. The spread of weed seeds must be carefully controlled. The soil type, which is sandy loam and low in organic matter, is not ideal for normal growth of certain species. It might seem rather ironic, but some weed species are actually difficult to grow in a domesticated environment.

The benefits provided by the weed garden however, have far outweighed the minor problems which have occurred. Public response has exceeded expectations. During the summer months, many people visit the garden, including people from the U.S.A. and other provinces of Canada.

The weed identification garden at Harrow is becoming recognized as an important addition to the weed research program underway. ■

OUR BLOOMING INDUSTRY

L. JAMES

La mise au marché massive des fleurs coupées et en pots en a accru les ventes. Toutefois, pour exploiter les possibilités de ce marché, il faut élargir la base de production, élaborer de nouvelles méthodes de production, créer de nouveaux cultivars et établir de nouvelles catégories. Les travaux effectués par le Service fédéral de recherches sur les plantes ornementales, ont aidé les floriculteurs à accroître leur production et à solutionner quelques-uns de leurs problèmes.

Cash-and-carry boutiques sell flowers once handled only by traditional florist outlets

Flower power is sweeping the country again. But this time it's real flowers that have caught the public's attention. "Floriculture is the fastest growing segment of Canadian agriculture", says Tom Bennett, a horticultural economist in Agriculture Canada's Marketing and Trade Division.

The power of "mass merchandising" has made potted and cut flowers easily accessible to the average consumer. Supermarkets, department stores and cash-and-carry boutiques are selling flowers once handled almost exclusively by traditional florist outlets.

According to industry officials, Canada's floricultural industry sells an estimated $400 million of flowers and related services at the retail level each year. Approximately 37 percent of the cut flowers are roses, 28 percent chrysanthemums and 21 percent carnations. The major pot plants are chrysanthemums, poinsettias and geraniums.

In 1973, the farm value of greenhouse floricultural crops was $69 million, 8 percent above 1972 and 88 percent above the 1967-71 average. These crops were produced in about 19 million sq. ft. of greenhouses. The major producing province is Ontario, which produced 64 percent of the total farm value of floricultural crops in 1973. Most producers in Ontario are located in the Niagara and Leamington area. About 15 ac of new greenhouses were built in southern Ontario in 1974 for pot plants and flowers, indicating a buoyant market.

Several trends have characterized the growing popularity of flowers. Increased affluence has given Canadians more disposable income for luxury items. Changing lifestyles have resulted in more leisure time, perhaps creating a need for pleasing surroundings, especially in metropolitan centers. An awareness of ecology and appreciation for the natural environment has been reflected in increased decoration of homes and office buildings with flowers and ornamental plants. However, the trend to non-florist retailing has had the greatest impact on increased consumer utilization of flowers.

Mass Merchandising

The recent trend to purchasing flowers in mass market outlets indicates that Canadians agree that flowers are for pleasure. Producers are hopeful that this will remove the stigma that flowers are only for weddings, funerals and very special occasions.

In 1960, consumers bought about 25 percent of their commercial floricultural needs from non-florist retail outlets. In 1970, this increased to 35 percent and by 1980 it's expected that consumers will buy at least 50 percent of their flowers from mass market outlets. At the same time, total consumer expenditure for these goods and services in 1980 may double the 1970 level. This indicates rapid

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growth for both traditional florists' shops and mass market outlets. But in relative growth, sales through mass markets may increase at a faster rate.

On a daily basis, about 25 percent of the flowers in Canada are sold through mass markets, with a much higher volume during special events like Christmas and Easter. Most of the mass markets buy flowers from wholesalers, although some producers sell directly to the chain stores.

Three Dutch clock flower auctions operate in Canada at Toronto, Montreal and Vancouver. About 70 percent of the flowers sold through the auctions are pot plants. According to industry officials, the auction system

The power of mass merchandising has made potted and cut flowers easily accessible to the consumer.

tends to stabilize the price and provide a convenient method for small growers to market their product. They cater to both the traditional retail florists and the ''cash-and-carry'' buyers who handle plants at a lower mark-up than conventional florists. About 10 percent of Canadian production is marketed through the flower auctions.

Marketing Problems

The marketing of cut flowers and pot plants is the greatest untapped potential of any agricultural product in Canada, notes Tom Bennett. Mr. Bennett feels that a marketing structure must be developed along with expansion into the mass markets. However, before the industry can grow further, several changes must first be made:

- Traditional selling methods must give way to innovative, aggressive merchandising.
- New ways or improved methods should be developed to make flowers more easily accessible to the consumer.
- A dependable supply of suitable products and a good variety of flowers must be developed.
- Transportation problems in moving cut flowers or pot plants from the grower to the retailer must be eliminated.
- Personnel in mass retail outlets, such as supermarkets, must be trained to care for and market flowers.

If the potential of the mass market is to be realized, a broader production base, new production methods, and new cultivars and grades must be developed for this special market. In addition, promotion and production must proceed in harmony. Promoting products that are not available, or producing a product for which there is no market are equally disastrous, says Mr. Bennett.

The Marketing and Trade Division of the Economics Branch is organized to help the industry with its problems. In 1974, the Economics Branch provided the first production and marketing outlook for floricultural crops. In the future, Agriculture Canada economist Jane Teeter, the floricultural commodity specialist, hopes to provide additional information on future prospects based on sales volume, exports and imports, and also assist the industry in developing a marketing structure.

With the exception of carnations, Mr. Bennett notes that most imports are complementary to the Canadian floricultural industry. However, he stresses that because prices are vulnerable to imports and a downturn in the economy, it is important that this situation be watched very closely.

Trade

In 1973, Canada imported $21.9 million of cut flowers and pot plants. This was an increase of 29.5 percent above 1972. Although exports of floral plants, roots and bulbs to the U.S. have increased, the Canadian domestic industry has not been able to meet U.S. demand. Exports of floricultural crops totalled $5.9 million in 1973.

Many new flower species are imported into Canada for propagation and sale. However, to protect Canada against the entry of diseases and insects, an import permit, issued by Agriculture Canada's Plant Protection Division, is required before any rooted plant material enters the country. Because the United States is relatively free from diseases and pests foreign to Canada, plant material with a rooting medium such as soil or peat has been allowed into Canada for several years. However, until recently, no plants with a rooting medium could be imported from other countries. To allow the entry of new species from other countries, the Plant Protection Division has revised its requirements. Under strict supervision, plants grown in sterile me-

Agriculture Canada's annual chrysanthemum show in Ottawa delights thousands of spectators each year

A new white and pink Rieger Begonia has been produced by the Ornamentals Research Service as a result of x-ray mutation

diums, such as peat, vermiculite and synthetics, can now enter Canada. Although these new regulations are open to any country, only Belgium, Holland and Denmark have so far undertaken the sterile method. These new species should help to increase production while protecting Canada against foreign diseases and insects.

Research Aids Production

Increasing production is not a simple task. Floricultural production is characterized by its wide diversity of crops, highly sophisticated cultural methods, perishability of products, large capital investments, labor-intensive requirements, and dependence on timing of harvest. It also differs from other segments of agriculture by its year-round operations and high vulnerability to foreign competition.

Research by Agriculture Canada's Ornamental Research Service (ORS) has assisted the floricultural industry to increase production and overcome some of its inherent problems. New cultivars and cultural methods have been developed to give flowers longer life. Increased sales of at least several species such as poinsettias, azaleas and chrysanthemums are directly attributable to these developments.

Scientists at the Ornamental Research Service, under the direction of Dr. A. P. Chan, are currently working on pot plants and cut flowers to develop new varieties which would be acceptable to the consumer. Alstroemeria, a cut flower plant leased from Holland, is being evaluated by Dr. J.

M. Molnar, Chief of the Ornamentals Research Section. Dr. Molnar hopes to find the flowering responses of Alstroemeria to temperature, day-length and light intensity. Since Alstroemeria is a cool temperature plant, it could be a valuable addition to the presently available cut flowers.

New cultivars of other species are also being evaluated. Three x-ray mutations of Rieger begonias developed by the ORS will probably be released to growers in the near future, if under trial they continue to exhibit superior qualities to existing cultivars. A pink rose mutation is also being propagated to evaluate its bloom production and keeping qualities.

The Sidney Research Station has also made a collection of fuchsias that is the largest in Canada.

Improving crop management techniques is a major part of the research program at the ORS. A method of producing more compact plants with shorter stem length through the use of growth regulators is being evaluated by Dr. Molnar. Research has shown that high intensity lamps are twice as efficient as fluorescent lights. Dr. Molnar hopes to determine the best combination of sodium and mercury lamps for floriculture. Watering systems for gloxinia are also being evaluated. Dr. Molnar has found that gloxinia grown on sub-irrigation mats grow more uniformly than plants watered with the spaghetti watering system.

Dr. E. V. Parups is working to develop a chemical spray to disbud lateral shoots on chrysanthemums. He emphasizes that the spray has not been completely successful, but that it could have some practical application for growers. But first, timing, dosage, varietal responses and methods of application must be determined.

The Ornamental Research Service is one of the few centers in Canada studying pests and diseases on flower crops. Dr. T. Burnett, the only Canadian entomologist working full-time on insect problems in floriculture, hopes to develop an integrated biological control program for pests. He is studying the two-spotted mite and the greenhouse whitefly, the major pests of poinsettias and chrysanthemums. Dr. A. T. Bolton, a plant pathologist, hopes to find an effective control for soil borne diseases, mildew and Botrytis, the major disease problems of floricultural crops.

A preservative for cut flowers, called Flower Care, has been developed by Dr. Parups and Dr. Chan. The preservative inhibits the growth of microorganisms that impair the movement of water in the stem. In addition, sugar and iso-ascorbic acid are taken up by the flowers to help keep them fresh and healthy.

Flower Care benefits most cut flowers. Tests have proved that it will lengthen the vase life of carnations, snapdragons and roses. A fresh-cut rose kept in Flower Care solution will live for 10 days, twice as long as its usual life-span in water.

Flower Care has been patented in Canada and the United States. Royalties are turned over to Flowers Canada, an association of producers, wholesalers and retailers, for research. Packets of the preservative are enclosed with bouquets of flowers supplied by members of Flowers Canada. By extending the vase life of flowers, Flower Care will be an economic boon to greenhouse owners and florists.

With the assistance of new products like Flower Care and the introduction of new varieties and production methods, Canada's floriculture industry should continue to find favor among Canadians. ■

Alstroemeria a cut flower plant leased from Holland could be a valuable addition to the presently available cut flowers

HOLLOW STEM IN BROCCOLI

J. A. CUTCLIFFE

La fréquence des cas de tige creuse du brocoli a été considérablement réduite en diminuant l'écartement des plants, mais elle a légèrement augmenté avec l'accroissement de la fumure azotée. L'espacement des plants et la fertilisation azotée ont eu des effets différents selon les cultivars utilisés.

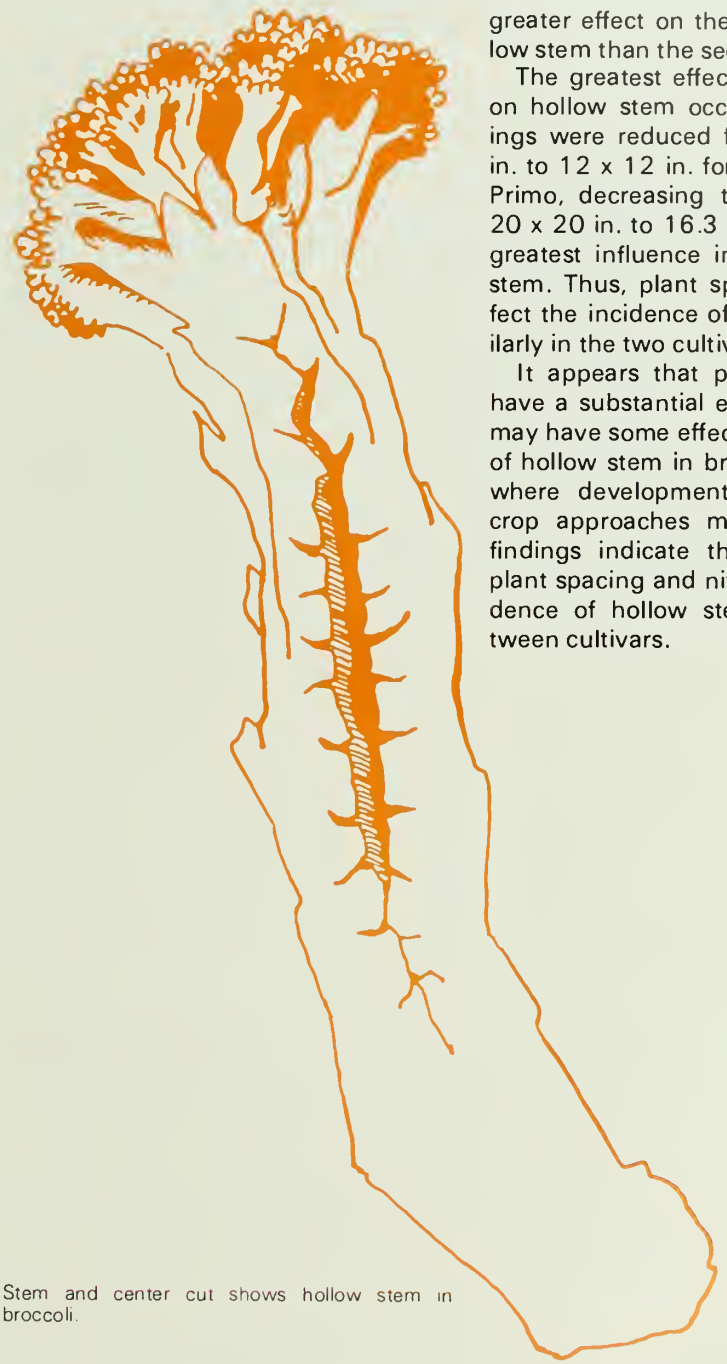
Hollow stem generally occurs in 30 to 60 percent of the centre heads of broccoli *(Brassicae oleraceae* L. var. *italica* plenck) grown in Prince Edward Island. The hollow stem condition begins following the initiation of the central inflorescence. Gaps that develop in the tissues gradually enlarge to create a hollow stem. There is ordinarily no discoloration of the surfaces of these openings at harvest. However, discoloration and pith breakdown may develop soon after harvest.

In our investigation at the Charlottetown Research Station, we have directed attention to the effects of plant spacing and nitrogen fertilization on the incidence of hollow stem in broccoli.

Our results indicate that both plant spacing and rate of nitrogen application affect the incidence of hollow stem. As the distance between plants increased, the percentage of marketable heads with hollow stem increased at all nitrogen levels. As the rate of nitrogen increased, the percentage of marketable heads with hollow stem increased at all plant spacings. Nitrogen applications ranged from 80 to 240 lb/ac. Statistical analysis of the results showed that plant spacing had a significant effect on the percentage of hollow stem in all trials. Nitrogen increased the incidence of hollow stem considerably in the variety, Gem Hybrid, but the effect of nitrogen on hollow stem in Primo was not significant. The first increment of nitrogen had a greater effect on the incidence of hollow stem than the second increment.

The greatest effect of plant spacing on hollow stem occurred when spacings were reduced from 16.3 x 16.3 in. to 12 x 12 in. for Gem Hybrid. For Primo, decreasing the distance from 20 x 20 in. to 16.3 x 16.3 in. had the greatest influence in reducing hollow stem. Thus, plant spacing did not affect the incidence of hollow stem similarly in the two cultivars.

It appears that plant spacing may have a substantial effect and nitrogen may have some effect on the incidence of hollow stem in broccoli, particularly where development is rapid as the crop approaches maturity. Also, our findings indicate that the effects of plant spacing and nitrogen on the incidence of hollow stem may vary between cultivars. ■



Stem and center cut shows hollow stem in broccoli.

Mr Cutcliffe is head of the Horticulture Section, CDA Research Station, Charlottetown, P E I

REDUCING HERBICIDE SPRAY DRIFT

R. GROVER

Les chercheurs de la Station de recherche de Regina ont élaboré plusieurs méthodes destinées à réduire les possibilités de dérive du brouillard de pulvérisation provenant des pulvérisateurs agricoles. Pour minimiser les risques de dérive, ils proposent d'utiliser des esters à faible volatilité, de réduire la pression de pulvérisation, de ne pulvériser que si la vitesse du vent est inférieure à 15 mph (24 km/h) et que sa direction ne risque pas d'endommager les cultures sensibles avoisinantes.

As much as 10 million lb of 2,4-D and MCPA may be sprayed annually on cereal crops in the three prairie provinces. Drift hazards from the large scale use of these herbicides have always been recognized. However, the present trends in the diversification of crops and environmental concerns have made it imperative that these hazards be minimized.

Since 1969, the Regina Research Station and the Saskatchewan Research Council, Saskatoon, have been carrying out cooperative field trials to evaluate the drift potential of herbicides, especially 2,4-D, the most commonly applied herbicide in the prairies. Typical ground rigs have been used to evaluate spray drift under actual farm spraying conditions.

Studies carried out at the Defense Research Establishment, Suffield, Alberta, between 1969 and 1972 evaluated the relative drift potential from the ester and the amine salt formulations of 2,4-D. As a result of these studies, it was shown that when the ester forms of 2,4-D were used, vapor losses both during and immediately after spraying were the main contributors to off-target drift (see table). The relative magnitude of the drift potential for the three commonly used formulations was 25 to 35 percent for the high volatile butyl esters, 10 to 15 percent for the low volatile *iso*-octyl ester, and 4 to 6 percent for the relatively non-volatile amine salts.

These results clearly demonstrated the hazard of ester forms of 2,4-D and suggest that if ester formulations are needed only the low volatile ester should be used. The use of ester forms of 2,4-D should be completely eliminated where susceptible crops are grown in the vicinity.

There is no doubt that vapor drift can be reduced or even eliminated by controlling the use of these formulations. However, the droplet drift, the 4 to 6 percent fraction, is inherent in all herbicide spray operations with the existing application equipment.

Recent work at the station has been centered on reducing the droplet drift potential from the existing farm spraying equipment. During the last two summers, collaborative field studies have been carried out at the Regina Research Station to understand the effect of wind speed, hydraulic pressure, and gallonage sprayed per acre on the droplet drift potential of the flat-fan spray nozzles that are commonly used on the prairies. The nozzles tested were: (1) low volume (5 gpa), TeeJet 650067; (2) high volume (10 gpa), TeeJet 65015, (both nozzles can be used at pressures ranging from 25 to 40 psi); and (3) TK.75 nozzle, which is a low volume (5 gpa), high pressure nozzle.

Volume sprayed and hydraulic pressure affected the droplet drift potential of the two TeeJet nozzles when operated at various wind speeds (Figure 1). The drift potential of the low volume (5 gpa) TeeJet 650067 nozzle was lowered from 4 to 6 percent to 2 to 6 percent when the pressure was lowered from 40 to 25 psi, depending on the wind speed at the time of the trial. It is apparent that reducing the hydraulic pressure lowered the drift potentials by about half, but only at the lower wind speeds. A similar trend was evident for the high volume TeeJet 65015 nozzle, although the effect of pressure was less pronounced.

However, when the volume sprayed was increased from 5 to 10 gpa, the drift potential of these nozzles decreased from 4 to 6 percent to 1 to 4 percent at 40 psi and from 2 to 6 percent to 1 to 4 percent at 25 psi, again depending on the wind speed at the time of spray application (Figure 1). Thus, the effect of increasing the spray volume from 5 to 10 gpa at two pressures and at varying wind speeds was much more pronounced than from reducing the pressure alone.

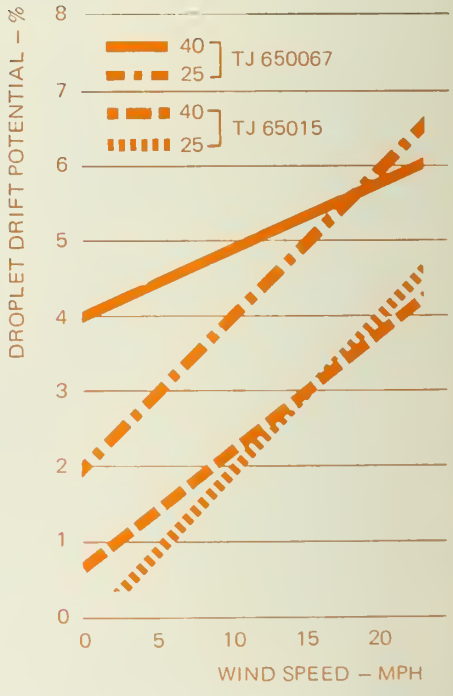


Figure 1 The droplet drift potential of TeeJet 650067 (5 gpa) and TeeJet 65015 (10 gpa) nozzles when operated at two pressures and varying wind speeds

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Figure 2 The droplet drift potential of TeeJet 650067, TeeJet 65015, and Tk 75 (5 gpa) nozzles when operated at recommended pressure of 40 psi and at varying wind speeds

Figure 3 Researchers at the Regina Research Station evaluate spray drift potential under actual farm spraying conditions

RELATIVE DRIFT POTENTIAL OF VARIOUS 2,4-D FORMULATIONS

Formulation	Drift potential as	
	Droplets	Vapor
	percent	
butyl esters[1]	(4 - 6)	25 - 35
iso-octyl ester[2]	(4 - 6)	10 - 15
amine salt	(4 - 6)	—

[1]High volatile esters
[2]Low volatile ester

At low wind speeds, the drift potential from the TK.75 nozzles was equal to that from the high volume 65015 nozzles (Figure 2). Both nozzles performed better than the low volume 650067 nozzles. At high wind speeds, their performance was as follows: TK.75> TJ65015> TJ650067.

Minimizing Drift

Herbicide drift can be minimized by understanding the factors relating to formulation types, environmental conditions, and operational characteristics of the existing farm spraying equipment. An intensive educational campaign to inform the farmers of the hazards of drift and the measures they can follow to minimize these hazards, even with the existing farm spraying equipment, should be undertaken. Some of the highlights that can be publicized are:

- Use ester formulations only when necessary and then only the low volatile esters should be used.
- Do not spray any ester formulation when susceptible crops are in the vicinity.
- Do not spray less than 10 gpa with nozzles that are designed to deliver 10 gpa at tractor speeds of about 4 m.p.h.
- Reduce the spray pressure from 40 to 25 or 30 psi (the height of the spray boom should be adjusted to obtain proper spray overlap).
- Spray only when wind speeds are less than 15 m.p.h.
- Spray only when the wind direction is away from the susceptible crop. ■

DEGRÉS CELSIUS ET AGRICULTURE

C. E. OUELLET

The section of the Celsius temperature scale that is relevant to agriculture is the spread between —50 to 100°C. However, most plant growth occurs between 0° to 50°C with the most rapid growth between 15 and 30°C.

Depuis le premier avril 1975, les réseaux de communication utilisent l'échelle Celsius de température dans leurs prévisions atmosphériques et agricoles. Voilà l'occasion de faire la liaison entre cette échelle et l'agriculture, surtout pour les cultures. Le présent article servira à rationaliser l'usage de cette échelle et à établir des points de repères facilitant la comparaison entre les différents niveaux de température.

L'intervalle de l'échelle Celsius qui comporte le plus d'applications en agriculture va de —50 à 100°C. Rares sont les années où la température baisse au-dessous de —50°C dans le territoire agricole du Canada. Sauf les températures de cuisson, les températures de traitement dépassant 100°C sont aussi rares.

De —50 à 100°C, trois secteurs

On peut diviser cet intervalle en trois secteurs d'égale grandeur: —50 à 0°C, 0 à 50°C et 50 à 100°C. La raison principale en est que la croissance végétale s'effectue entre 0 et 50°C suivant les plantes et les phases de croissance. Des plantes arctiques et alpines croissent à 0°C et certaines plantes bulbeuses commencent à croître juste au-dessus de cette température. Par ailleurs, la température de 50°C est généralement considérée comme léthale pour la plupart des plantes et des animaux. Notons aussi que les points de congélation et d'ébullition de l'eau à la pression atmosphérique normale de 76 cm de mercure correspondent respectivement à 0 et 100°C.

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De —50 à 0°C

Le secteur de —50 à 0°C peut être considéré comme celui du gel des plantes et de la congélation des aliments. La période de végétation est souvent définie comme l'intervalle entre la dernière date au printemps et la première à l'automne où survient une température de —2°C. Cette température gèle le feuillage de nombreuses plantes et met fin à leur croissance. Beaucoup considèrent la température de —4°C comme celle marquant l'arrêt de toute végétation. Si les plantes vivaces cultivées au Canada peuvent survivre à des températures beaucoup plus basses en hiver, c'est qu'elles subissent un endurcissement au froid à l'automne, dont le degré varie avec les plantes et le climat. Ce secteur de température est aussi celui où se situent les températures de conservation des aliments congelés, qui ne doivent pas être plus élevées que —18°C environ.

De 0 à 50°C

Le secteur de 0 à 50°C est sans doute le plus intéressant et le plus important en agriculture, puisqu'il concerne la croissance des plantes. Afin de mieux en saisir l'aspect biologique, divisons-le en trois sous-secteurs: 0 à 15°C, 15 à 30°C et 30 à 50°C.

La *germination* et la première croissance des plantes s'effectuent généralement entre 0 et 15°C, températures qui prévalent surtout au printemps et à

l'automne. Les plantes sensibles au froid, comme la tomate et le melon, doivent se cultiver durant la période sans gel (au-dessus de 0°C). On considère la température de 5°C comme celle à partir de laquelle la majorité des plantes manifestent une croissance significative. Aussi, le calcul des degrés-jours de croissance est-il ordinairement basé sur cette température. On mentionne généralement comme température minimum de germination dans le sol:

2°C pour la laitue et l'oignon;
3°C pour l'avoine, l'orge et le blé de printemps;
4°C pour la betterave, le chou et la carotte;
10°C pour le maïs et la tomate.

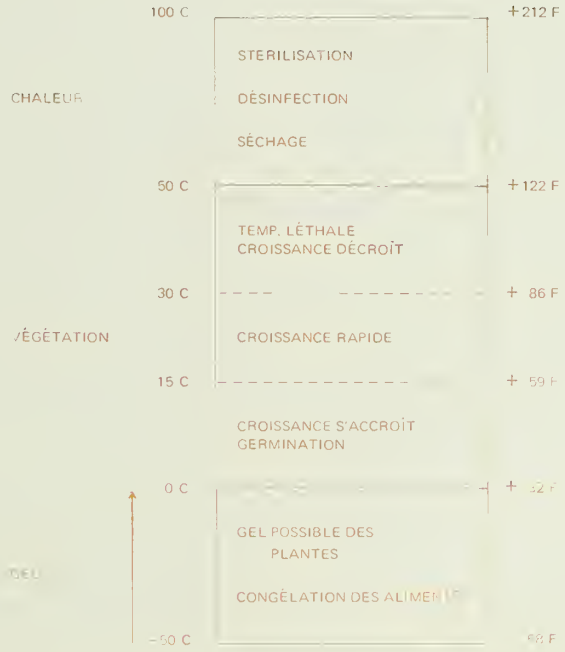
La *croissance rapide* de la plupart des plantes s'effectue entre 15 et 30°C, températures qui prévalent ordinairement en été. Le maïs, par exemple, demande une température de 19 à 27°C pour une croissance normale et la température optimale pour la tomate est de 24°C. Soulignons qu'il existe généralement un écart considérable entre les températures du jour et de la nuit. Ainsi, en juillet, l'écart moyen varie entre 13 et 16 degrés C selon les stations dans les provinces des Prairies et entre 9 et 16°C en Ontario.

Une *réduction du taux de croissance,* suivie de sa cessation complète et même de la mort de la plante aux températures plus élevées, se produit entre 30 et 50°C. Théoriquement, la température optimale de croissance des céréales (avoine, orge, blé et seigle) peut aller jusqu'à 31°C. En pratique, des températures trop élevées s'accompagnent souvent de sécheresses sérieuses, qui sont nuisibles à la croissance. Une croissance trop rapide peut retarder la fructification, produire des plants de faible structure, susceptibles aux insectes, maladies et autres fléaux agricoles.

De 50 à 100°C

Le dernier secteur, 50 à 100°C est celui où se pratique le traitement à la chaleur de différents produits. On mentionne 82°C pour la désinfection du terreau utilisé pour le tabac jaune. Les températures maximales pour le séchage des grains de céréales destinés soit à l'industrie de transformation ou soit à l'alimentation animale sont de 54 et 77°C respectivement. Notons que dans le cas de grains de céréales destinés aux semences, la température de séchage ne doit pas excéder 43°C, et cela afin de conserver leur pouvoir de germination. Comme on le sait, la stérilisation des denrées s'effectue généralement à des températures excédant 100°C.

Graphique indiquant l'intervalle de l'échelle Celsius de température et les secteurs les plus utilisés en agriculture



Échelle Celsius et degrés-jours

Ainsi compartimentée, l'échelle Celsius de température peut devenir d'un usage simple et logique. Elle peut être reliée facilement aux phénomènes biologiques et seules les températures au-dessus de 0°C sont à considérer pour la croissance. L'intervalle de température entre les points de congélation et d'ébullition de l'eau a été divisé en 100 pour l'échelle Celsius et 180 pour l'échelle Fahrenheit. Ceci explique pourquoi la valeur des degrés-jours de croissance Celsius est presque deux fois celle des degrés-jours Fahrenheit. Ainsi, 800 degrés-jours Celsius équivalent à 1440 degrés-jours Fahrenheit, soit 800 degrés-jours Celsius x 1,8.

Reste le problème de conversion à la ferme. Le plus simple est d'utiliser un thermomètre Celsius. Dans les autres cas, les tables de conversion disponibles à la Division de l'information d'Agriculture Canada devront être utilisées. ■

BOXED BEEF FOR CANADA?

CAROL PAULSON

Les techniques améliorées d'emballage du bœuf pourraient amener à une plus grande centralisation de l'emballage et plus d'efficacité dans le contrôle de la qualité, la distribution et la mise en marché de la viande. Les agents du ministère de l'Agriculture du Canada croient que l'adoption industrielle de ce procédé ne devrait pas entraîner une baisse de la qualité de la viande.

Boxed beef could be the biggest change in beef merchandising since retailers quit killing cattle in the back of the store. Yet, although pork and lamb are handled in this way, the beef industry is cautious about switching.

Boxed beef is the process that makes a centralized system of meat breaking, packaging, transportation and retailing possible. In the process, primal and subprimal cuts are trimmed, packed in dry ice or a vacuum bag, and then placed in cartons or containers; hence, the name, 'boxed'. The kind of cuts boxed depends on the buyer and can include the subprimal cuts or any retail cut, such as oven-ready ribs, ribeye rolls, boneless stew beef, minced beef and tenderloin.

Proponents of centralized processing and boxed beef point out the following benefits.

For the Packer

- The by-products of meat cutting, such as fat, bone and meat scraps, are centrally located and easily accessible to renderers.
- A trade in cuts can be established and the demands of the hotel, restaurant and institute business can be met. This trade has traditionally been unable to obtain the volume of cuts it needs from Canadian packinghouses and has had to buy from sources in the United States.

For the Retailer

- Freight costs are reduced because only the useful parts of the carcass are shipped and, due to boxing, are packed in the highest density possible.
- There is a minimum of contamination because the meat is handled directly at only one location. One study showed that in present fresh beef processing procedures, the meat is handled by 19 people.
- The product retains its quality longer and ages in the bag.
- The carcass does not shrink at the plant, in transit, in the warehouse or at the store because of the vaccum bag. Shrinkage in the present system of merchandising amounts to about 5 percent.
- Custom cuts and high volume items can be ordered in quantity.
- Inventory is reduced because slow-moving items are not ordered.
- Valuable butcher time is utilized to best advantage because it takes less time to turn boxed beef into retail cuts than to process halves and quarters.
- If a store chooses to order boxed retail cuts, backroom facilities can be reduced to a refrigerator-freezer unit.
- At the loading dock, boxes are easier to handle than half or quarter carcasses.

Many of these benefits mean a cost saving to the entire meat industry, and the consumer.

Handling Requirements

Only a small proportion of the beef sold in Canada is boxed. According to C.G. Bowes, a North American merchandising specialist, caution in adopting this practice originates in some early experiences. Some retailers noticed a different odor from opened bags of vacuum-packed beef. In most cases, the odor disappears when the meat has been exposed for a few minutes to air and it leaves no residue in the meat.

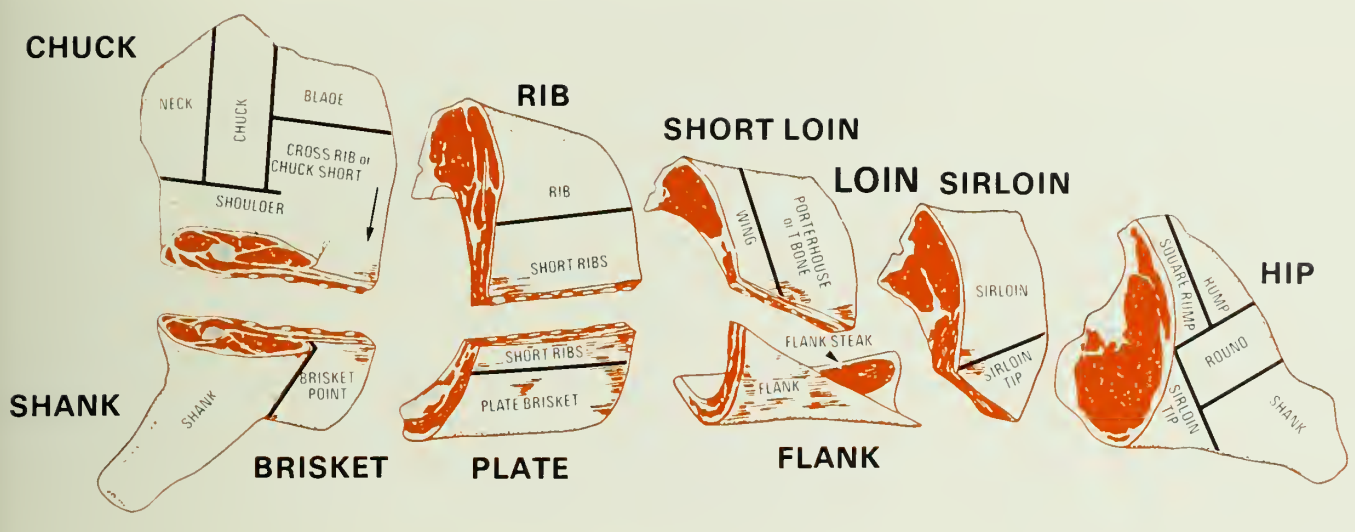
However, in some incidences, the odors remained. Commonly, packers broke and boxed carcasses that, for some reason, were not sold to a fresh meat distributor. Also, carcasses were often bought from the packer and shipped to a breaking plant elsewhere. In both of these procedures, the meat has aged and possibly started to deteriorate. When it is finally boxed, the decay process continues and builds up offensive odors. Consequently, carcasses should be boxed as soon after slaughter as possible.

The second problem with boxed beef is the juices in the bag. This, too, is a management problem and is mostly due to inadequate refrigeration somewhere along the transportation and handling chain. Boxed beef should be kept just at freezing in the warehouse, on the loading dock, on the truck and at the store. There is no problem with juices in meat that has been shipped in carbon dioxide rather than in the vacuum bag.

Agriculture Canada's Involvement

If boxed beef becomes a major market commodity, Agriculture Canada officials are confident that meat quality for the consumer will be maintained. Mr. G.L. Locking of Agriculture Canada's Livestock Division points out that the current beef grading standards are well adapted to the boxed beef system of marketing. A carcass graded A1 in the packing plant retains its grade through to the consumer.

Carol Paulson is an editor-writer, Periodicals Services Unit, Information Division, CDA, Ottawa



All primal cuts are used for boxed beef Four of these—chuck, rib, loin and hip—are also broken and trimmed for boxing

There is some pressure to develop a supplementary grade standard for primal and subprimal cuts. However, considering the very specific standards established for whole carcasses, this may not be necessary.

The Health of Animals Branch maintains inspection at slaughter houses as well as at breaking plants, so standards of quality and cleanliness are already established. Should the industry switch to boxed beef, the Health of Animals Branch would be ready.

Although there has been talk over the past 5 to 10 years about switching to a boxed beef system, Canada's meat trade is geared to transporting whole carcasses from western Canada to the breaking plants in Ontario and Quebec. In fact, the railway companies have spent millions of dollars researching and developing the present system. Dr. C.K. Hetherington of the Meat Inspection Division, Health of Animals Branch, emphasizes that Canada has the finest, most sanitary boxcars and the best inspection system in the world!

Several Canadian supermarket chains recognize the value of the boxed beef process and operate central cutting plants in which purchased carcasses are broken into subprimal cuts, boxed, then distributed to the chain's stores for breaking into retail cuts. Several other chains are interested in adopting this procedure. However, after many discussions with people in the meat industry, D.L. MacLachlan of Agriculture Canada's Food Systems Branch believes that the best service and efficiency to the total system can be obtained when boxing is done at the packer (slaughterhouse) and not at a retailer-owned central packaging plant.

Few facts have been collected about the status and implication of boxed beef in Canada. But the Agricultural Economics Research Council, under direction of Agriculture Canada's Research Branch, is currently studying some of the important factors. These include:

- Current status of boxed beef, its technology and potential;
- the way that boxed beef could best be implemented;
- implications of such a system to producer, processor, retailer, and consumer.

Dr. A.S. Johnson, also with the Food Systems Branch, anticipates that if a few major packinghouse companies adopt the boxed beef process, the meat merchandising industry will utilize it. Then the retail companies can concentrate on what they do best—retailing—and can leave the processing up to the specialists. Fortunately, Canada's grading and inspecting procedures would continue to ensure that consumers receive the high quality, uniformly graded meat that they've become accustomed to. ■

SILICEOUS URINARY CALCULI FROM CATTLE

C. B. BAILEY

Les chercheurs de la Station de Lethbridge ont examiné les calculs de bouvillons dont les voies urinaires étaient obstruées, dans le but d'en étudier la formation. Ils ont constaté que ces derniers se forment lorsque la silice colloïdale, produite dans l'urine sursaturée, s'agrège en masses. Des couches de silice, et parfois d'oxalate, se forment autour de la silice colloïdale pour produire les calculs.

Range cattle in the Canadian southern prairies and in adjacent areas of the United States are prone to the formation of urinary calculi that can block the urinary tract. A similar problem occurs in Australia in both cattle and sheep. Unless surgery is performed on affected animals, blockage inevitably causes death. In Canada, losses occur mainly among steer calves and principally during the period from weaning in the autumn until the end of the succeeding winter. The number of animals affected fluctuates markedly from year to year. In a bad year, up to 5 percent of the steers in problem areas can be lost.

Calculi from range cattle are composed predominantly of silica, but they also contain organic matter and calcium oxalate as well as small amounts of water, magnesium and phosphorus. Silica contained in the grasses that range cattle eat dissolve in the water of the digestive tract to form a saturated solution of silicic acid. Some of the dissolved silica is absorbed and excreted in urine. Due to the activities of the kidney, the concentration of silicic acid in urine is usually high and can sometimes increase to three or four times the saturation concentration.

Dr. Bailey is an animal physiologist in the Animal Science Section, CDA Research Station, Lethbridge, Alberta

In concentrated solution, silicic acid polymerizes to form small particles. These can aggregate into larger units that settle out of solution. It is not known whether this process occurs in urine or, if it does, by what mechanism the aggregates are transformed into calculi.

At the Lethbridge Research Station, we examined the fine structure of several calculi that had been removed from steers with blocked urinary tracts to investigate how calculi are formed. The findings suggest that calculi develop when colloidal silica, produced in supersaturated urine, aggregates into clumps that settle out of solution. These clumps appear to form the nucleus of most calculi and, in altered form, the bulk of the material that causes their subsequent growth.

We examined 74 calculi that ranged in weight from 20 to 558 mg and in diameter from 2 to 8 mm. They were usually roundish to ovoid and from white to greyish-brown in color. Surface texture varied from hard, smooth, and shiny to dull and chalky (Fig. 1). A characteristic external feature noted in 19 of the calculi was the presence of rounded protrusions distributed over their surface (Fig. 1, No. 17, 18, 20). The calculi were predominantly siliceous but a few contained appreciable quantities of calcium oxalate (see table).

Most calculi contained amorphous material at the center with laminar material arranged concentrically around it (Fig. 2). Two distinct types of amorphous material, white (Fig. 2, a) and mixed (Fig. 2, b), and two distinct types of laminar material, white (Fig. 2, c) and amber (Fig. 2, d), were found among the calculi but the relative amounts of each varied considerably in different calculi.

Calculi that contained any combination of white amorphous, mixed amorphous, and white laminar materials were highest in silica and lowest in oxalate. Conversely, calculi that containsd the highest content of amber laminar material, but the minimum of the other constituents were highest in oxalate and lowest in silica. The predominant mineral constituent in amber laminar material was oxalate and in the other three types of material was silica.

The fine structural characteristics of the white amorphous material found at the core of most calculi were strikingly like precipitates produced in solutions of silicic acid in the laboratory. Such precipitates form when colloidal silica particles aggregate into porous masses due to the formation of siloxane bonds between surface silanol groups. It is not unreasonable to suggest that the white amorphous material is produced by an analogous mechanism and that

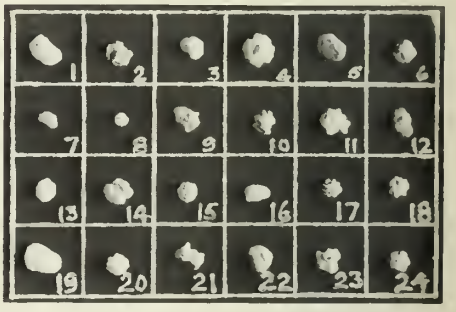


Figure 1 A representative selection of 24 of the calculi. The grid lines were drawn at 2 cm intervals.

AVERAGE COMPOSITION OF 74 CALCULI (%)

Component	Mean	Range
Silica	50.7	16.7-75.5
Calcium	4.7	0-17.9
Magnesium	0.06	0.01-0.58
Phosphorus	0.25	0.01-2.24
Calcium oxalate	13.8	0.01-57.3
Water	3.0	0-12.3
Organic matter	26.1	1.5-50.2

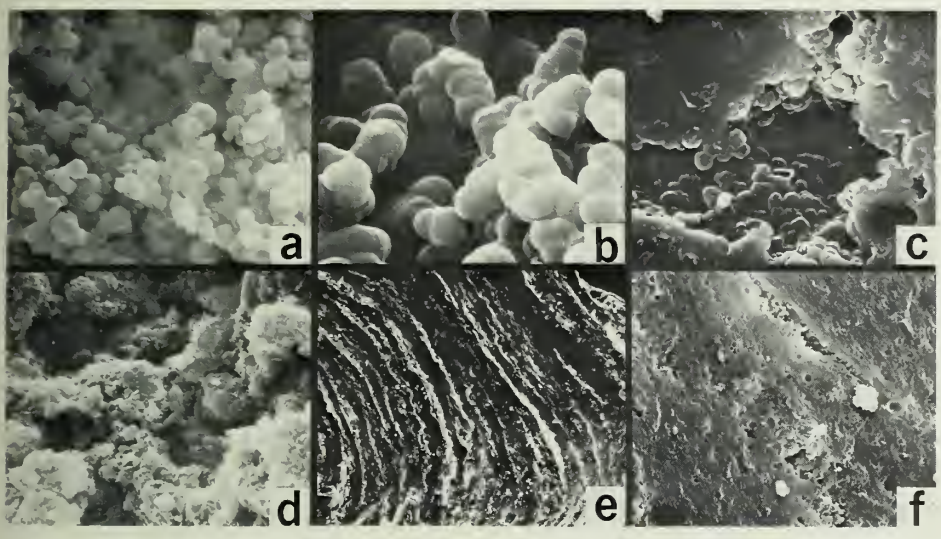
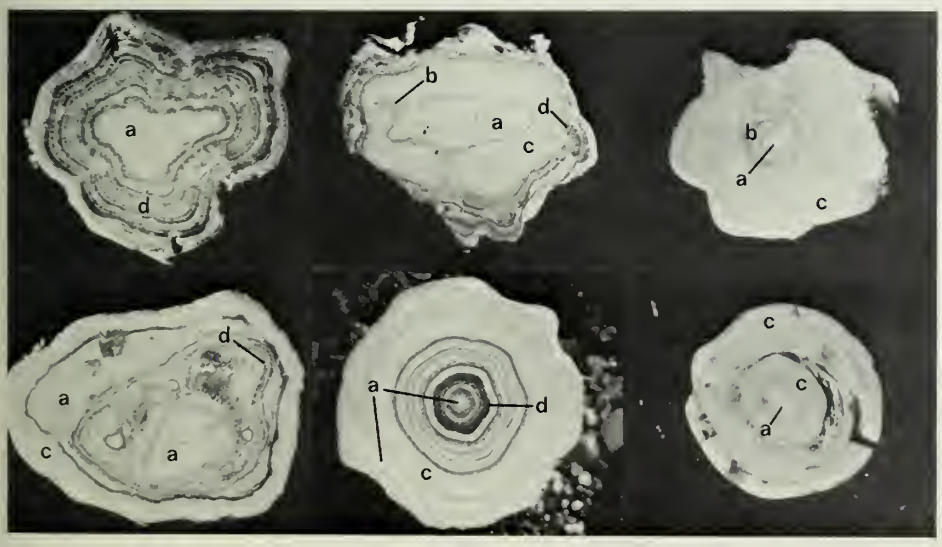


Figure 2 Cross sections of a group of calculi selected to show the variation in internal structure. Silica content ranged from a low of 21.3 percent (top left) to a high of 73 3 percent (lower right)

Figure 3 Fine structural features of calculi a and b, white amorphous material; c, hole in white laminar material; d, mixed amorphous material, e and f, white laminar material. Magnification a X 23,000; b X 19,000; c X 8,000; d X 13,500; e X 150; f X 1,750.



small particles serve as the nucleus for the further deposition of calculous material.

The white laminar material appeared to be composed of the same type of silica particles as the white amorphous material, suggesting that they were formed by the same process. Conversion of the porous form to the laminar could have occurred by rearrangement of bonds between particles so that they became more densely packed. The sharp distinction between individual layers in white laminar material indicates that each was deposited en masse during a single episode of silica precipitation. This suggests that high concentrations of silicic acid in the urine of range cattle occur intermittently.

Electron micrographs gave no indication of how the mixed amorphous material might have formed. Since it was primarily siliceous, it could have been precipitated by aggregation of colloidal silica particles. Precipitation of silica in the presence of insoluble organic matter could account for the mixed appearance of this component. Poorly mineralized organic material, which is dark brown in color, is occasionally found in calculi indicating that insoluble organic matter is sometimes produced in urine.

By analogy with human calculi formation, deposition of oxalate in cattle presumably occurs by crystallization from a super-saturated solution, but no indication of the processes by which this occurs was obtained. Nor is there any knowledge of the origin of the oxalate.

The results of this study suggest that most calculi that cause urinary obstruction in range cattle form by deposition of layers of silica, or less commonly, of oxalate, on a preformed fragment of colloidal-silica aggregate. Formation of the aggregate is thus the first step in the formation of most calculi. ■

PESTICIDES AND OVERTREE IRRIGATION SPRINKLERS

A. D. McMECHAN and
A. P. GAUNCE

Les chercheurs de la Station de recherche de Summerland ont évalué une méthode d'irrigation par aspersion pour l'application de bouillie insecticide dans les vergers à forte densité de plantation. La comparaison entre l'application par aspersion et l'application par pulvérisation à jet porté a révélé que la première était moins efficace que la seconde et pouvait même contaminer les sources d'irrigation.

Many of the high density orchards in British Columbia are irrigated through permanent overtree sprinkler systems. Some growers are interested in the possibility of using these systems for applying pest control sprays, as an alternative to purchasing a sprayer. To evaluate this method, we carried out experiments at Summerland to compare spray application through overtree sprinklers with application by two airblast sprayers. The experiments were carried out on a mature block of semi-dwarf apple trees on M7 rootstocks. Comparisons were made of spray deposits and pest control obtained with the different methods. We also investigated the safety aspects of applying pesticides through sprinklers.

Spray Application

The sprinklers used in the experiments were Rainbird 20A with 3.18 mm nozzle orifices. They were mounted on risers 4 m high on a spacing of 9 m by 12 m. Operating pressure was 2.8 kg/cm^2. In pre-spray trials, about 8 min of operation wetted the leaves without causing much runoff. On this basis, a spray injection and application time of 8 min was used. The spray chemical for each plot was mixed in a sprayer tank and injected into the irrigation line. In some plots, all the pesticide required for the treatment was injected during one 8-min cycle; in other plots it was injected in four 8-min cycles, with ¼ of the insecticide injected during each cycle. In the 4-cycle applications, 30 min was allowed between cycles to permit drying of the leaves. After each treatment the sprinklers were turned off and were left off for at least 7 days.

Injection of spray chemicals into an irrigation line is potentially very dangerous. To avoid the possibility of contaminating the supply, it is imperative to install what is known as a reduced-pressure principle, backflow-prevention device. This consists basically of two independent check valves with an automatic, pressure differential relief valve located between them. If for any reason the pressure in the supply line dropped below the pressure in the sprinkler system, this device prevented back-siphonage from the sprinkler system to the supply lines.

One of the airblast sprayers used was an experimental machine designed specifically for low-volume spray application in hedgerow plantings; the other was a commercial, low-volume sprayer.

INSECTICIDE DEPOSITS ON LEAVES

Year	Application method	Average deposit[1] on leaves at 3 heights in trees (ug/cm^2)		
		3.6m	2.4m	1.2m
1972	Airblast sprayer No. 1	1.58	1.58	1.53
	Airblast sprayer No. 2	0.90	1.33	1.39
	Sprinklers, 1-cycle	0.41	0.34	0.25
	Sprinklers, 4-cycle	0.28	0.23	0.18
	Check (no spray)	<0.05	<0.05	<0.05
1973	Airblast sprayer No. 1	1.30	1.02	0.82
	Airblast sprayer No. 2	1.09	1.33	0.88
	Sprinklers, 1-cycle	0.34	0.24	0.19
	Sprinklers, 4-cycle	0.20	0.14	0.12
	Check (no spray)	<0.05	<0.05	<0.05
1974[2]	Airblast sprayer No. 1	0.71		
	Airblast sprayer No. 2	0.44		Not
	Sprinklers, 1-cycle	0.14		Sampled
	Check (no spray)	<0.05		

[1]Each figure represents the average deposit for three sprays each year.
[2]Insecticide applied at one-half the rate used in 1972 and 1973.

AVERAGE INSECTICIDE DEPOSITS ON UPPER AND LOWER SURFACES OF APPLE LEAVES (ug/cm^2) FOR ONE APPLICATION.

Height in tree	Surface	Airblast No. 1	Airblast No. 2	Sprinklers 1-cycle	Sprinklers 4-cycle
3.6m	Upper	0.80	0.40	0.40	0.40
	Lower	1.65	1.00	0.15	<0.05
2.4m	Upper	1.50	0.50	0.45	0.35
	Lower	1.20	2.10	<0.05	<0.05
1.2m	Upper	1.05	0.55	0.35	0.25
	Lower	1.90	2.20	<0.05	<0.05

Mr McMechan is an agricultural engineer and Dr Gaunce is a chemist at the CDA Research Station, Summerland, B C.

A pest control spray is applied to an orchard through an overtree irrigation sprinkler

In each of the years, 1972, 1973 and 1974, three sprays were applied by each method for control of the codling moth. In 1972, an additional spray was applied for control of the white apple leafhopper. After each spray, leaf samples were taken for analysis of spray deposits. In one experiment, the spray deposits on the upper and lower surfaces of the leaves were analyzed separately. Insect control was checked at appropriate times.

Spray Deposits and Insect Control

The overtree sprinklers gave much poorer deposits at all sample heights than either of the airblast sprayers. They also gave much poorer deposits on the lower surfaces than on the upper surfaces of the leaves. In 1972 and 1973, the one-cycle sprinkler applications resulted in as good control of the codling moth as application by airblast sprayer No. 2; the four-cycle applications gave poorer control. The sprinkler application gave poorer leafhopper control in 1972 and poorer codling moth control in 1974 than applications with the airblast sprayers.

The results indicate that when pesticides are applied through sprinklers at the recommended rate, the deposits may be high enough to give reasonable control of pests such as codling moth larvae that are generally found on exposed upper surfaces of leaves or fruit, but will not likely give satisfactory control of pests such as leafhopper nymphs that are generally found on the lower surfaces of the leaves. Spray application through the overtree sprinklers was less efficient than application by the airblast sprayers. For this reason, and the potential hazard of contaminating the irrigation supply, this method cannot be recommended■

INSECT CONTROL

	Percent apples infested with codling moth at harvest			Leafhoppers per 100 leaves (1972)	
				1 day	3 days
	1972	1973	1974*	before spray	after spray
Airblast sprayer No. 1	1.05	0.50	6.80	413	0
Airblast sprayer No. 2	1.40	1.56	10.10	381	0
Sprinklers, 1-cycle	1.54	1.36	37.50	194	88
Sprinklers, 4-cycle	4.20	9.50	—	226	98
Check (no spray)	17.30	32.50	70.00	274	249

*Insecticide applied at one-half the rate used in 1972 and 1973.

ECHOES
FROM THE FIELD AND LAB

N.B. LEADS IN HOG QUALITY The central and western provinces of Canada have always bowed to the progress of the Maritimes in production of high quality hogs However, a recent switch in lead within the Maritimes may have escaped the attention of producers, note CDA Production and Marketing officials in Moncton.

Grading statistics for 1974 show that New Brunswick captured the honors for producing the highest graded hogs in Canada from Nova Scotia, the province that has been at the top for a number of years. Forty-two percent of New Brunswick hogs indexed 105 and over, while 38 percent of Nova Scotia hogs indexed 105 or better In all of Canada, only 19 9 percent of the hogs graded had an index of 105 or better.

Although governments can probably take some of the credit, production and marketing officials suggest that there are many contributing factors. Management and better utilization of feed due to feed costs are probably the major factors

SUNFLOWERS CROPPING UP? Another golden crop may soon appear on the horizon of more farms in Saskatchewan and Manitoba A $400,000 research and development program is under way to establish sunflowers as a major alternative crop for Saskatchewan and Alberta

The program, that will continue through 1978, involves the cooperation of university, government and industrial agencies as well as farmers who will be contracted to grow sunflowers at specified locations in the two provinces.

The University of Saskatchewan is administering the program through its crop development center. Agriculture Canada is providing technical coordination through the Saskatoon Research Station and is also covering half the cost of the project from the New Crop Development Fund Cooperating industries and the two provincial departments of agriculture will provide the other half of the project costs.

Sunflower seed oil is in demand in both domestic and foreign markets for cooking and salad oils. The meal is suitable for livestock feed and the seed protein may be used in a variety of food products.

FIELD SPRAYERS Chemicals are widely used on the farm to control weeds, insects and diseases. The effectiveness of the pesticide depends on the use of the proper chemical, application of the chemical at the recommended rate and at the proper time, and proper use of the right type of application equipment

A new Agriculture Canada publication, "Field Sprayers", contains information on hydraulic field sprayers, their component parts, and how to use them efficiently There are sections on three adaptations—boom-type, row-crop and utility sprayers—commonly used on Canadian farms, sprayer mounts, and operation of the sprayer Schematic drawings and photographs illustrate various attachments, pumps and types of sprayers available and their proper use A list of tips for successful spraying is also provided

Publication 1482 may be obtained from Information Division, Agriculture Canada, Ottawa, K1A 0C7

NEW GRADE LABELS ON EGG CARTONS New grade labels will soon start appearing on egg cartons A maple leaf symbol enclosing the letters and number that denote the grade has been required on egg cartons and packages since 1974 But the government gave the packaging industry time to gear up for the change and the new symbols are just now appearing on egg cartons.

The three grades bearing the maple leaf label are A 1, A and B Agriculture Canada doesn't allow the maple leaf on grade C, a grade that is not released on the retail market

The three grades indicate the quality of the egg and not the size. Grade A1 eggs are of superior quality with a small air cell and firm yolk and albumen (white). Grade A eggs have a slightly larger air cell and are slightly less firm Grade B eggs are used for baking or the production of processed eggs and have thinner yolks and albumen than the two top grades.

The maple leaf symbol will also be used on the metal breast tags fastened to fowl They indicate the quality of the bird, ensured by government graders in the packing plants

MILK RECORDING BOARD FORMED A new organization has been established to coordinate milk recording programs in Canada The Canadian Milk Recording Board will ultimately coordinate the maintenance, improvement and better utilization of milk recording programs to avoid duplication

At their first meeting, the 23 members of the board agreed to minimum standards for milk recording based on inspection procedures, monitoring controls for the quality of inspection, and eligibility and identification of animals D B Lambroughton of the Livestock Division, Agriculture Canada, notes that the standards of the federal ROP program are set well above the minimum standards Agriculture Canada will monitor all provincial milk recording programs to maintain the standards

All milk records from each province will be forwarded to the Livestock Division for analysis These records will be used for cow indexing and sire appraisal and a summary will be provided to the breed associations and A I units.

There are currently three provinces, New Brunswick, Quebec and Ontario, that operate official supervised milk recording programs The programs in other provinces will be recognized officially if they meet the new standards The Canadian Milk Recording Board will help to ensure that all provincial programs enable producers to have certified records of performance that will be reliable and on a uniform basis.

ECHOS
DES LABOS ET D'AILLEURS

Agriculture Canada plant breeder, Sylver Smoliak, of the Lethbridge Research Station checks a fababean test plot

FABABEAN PRODUCTION Fababeans in Canada appear to have great potential for feeding livestock Their excellent nutritional qualities, universal palatability and ease of preparation make them a promising new crop

A new Agriculture Canada publication, ''Growing and Using Fababeans'', outlines production methods and the use of fababeans in livestock and poultry rations. This publication is based on research conducted by staff at the University of Manitoba and the Manitoba Department of Agriculture, and is published under the provisions of the Federal-Provincial Regional Cooperative Publishing Program.

The first section of the publication, Growing Fababeans, covers seedbed preparation and planting, weed control, diseases and insects, harvesting, and silage. The remainder of the publication deals extensively with the use of fababeans in livestock and poultry feeds, including examples of rations that contain fababeans The publication points out that the value of this crop is directly related to the price of soybeans and other protein sources

To obtain this publication, request Publication 1540, 1975, from. Information Division, Agriculture Canada. Ottawa, K1A 0C7

PULVÉRISATEURS AGRICOLES En agriculture, l'emploi des produits chimiques est si courant que le pulvérisateur, tout comme la charrue, a sa place à la ferme La publication 1482 est le manuel pratique pour l'emploi d'un pulvérisateur Ceux qui désirent s'en acheter un devraient la consulter car elle donne des renseignements d'ordre technique qui facilitent le choix de tel ou tel modèle Ceux qui en possèdent déjà un devraient également la consulter pour l'entretien, les réglages et calibrages de toutes sortes nécessaires au bon fonctionnement et à la longue vie du pulvérisateur La préparation des bouillies de pulvérisation fait aussi l'objet d'un chapitre.

Puisque les produits chimiques ont un usage spécifique il ne faut les utiliser que là où ils sont utiles Le chapitre sur la décontamination prend toute son importance quand on pense aux pertes de cultures que peut entraîner les restes d'un produit dans le réservoir, les pompes, les tuyaux etc sur une autre culture

Finalement cette publication, outre les données en système impérial, possède aussi tous les renseignements en système métrique.

On peut l'obtenir de la division de l'information d'Agriculture Canada, Ottawa, K1A 0C7

INSECT INDENTIFICATION SERIES The Information Division will soon be releasing the first leaflets of a new insect identification series 8y 1977, 100 leaflets, each on one of the major pests in fruits, vegetables, field crops and livestock, will have been issued The information leaflets will be bilingual and will help commercial producers and hobbyists to identify destructive pests The life cycle of the pest, and the damage it causes the host, are illustrated in color.

The three-color process used by G H Parker of the Information Division will be used to print the leaflets The quality of reproduction possible with this relatively inexpensive technique is illustrated in the flower article in this issue of Canada Agriculture

The identification leaflets will be listed in the index of publications and single or bulk quantities of copies will be available on request from the Information Division, Agriculture Canada, Ottawa, K1A 0C7

CANADIAN MEAT AND LIVESTOCK OBJECTIVES Representatives from all the major segments of Canada's meat industry have worked to prepare a newly released report of the objectives. The report was developed as a framework reference for the components (producers, processors, retailers, consumers, governments, etc.) of the industry

The major objectives are:

—to develop potential markets for meat, livestock, poultry and their products;

—to further develop and improve production capabilities to meet market opportunities and to promote needed long-term structural adjustment while avoiding unnecessary short-term adjustment,

—to further develop and improve processing capabilities to meet the needs of the system;

—to improve marketing, distribution and merchandising of meat and livestock and their products, and

—to develop and maintain an effective communication and information system.

Each objective is further identified by sub-objectives pointing out the areas that have to be developed to build our meat industry The report also contains specialized objectives for the individual commodities of beef, pork, lamb and poultry

A copy of the report may be obtained from the Food Systems Branch, Agriculture Canada, Ottawa, K1A 0C5

LE CHOU FOURRAGER DANS L'EST DU CANADA M Ghislain Pelletier, spécialiste des fourrages à la Station de recherche de Lennoxville, et M J.-F.-P Darisse, chercheur à la ferme de Normandin, ont entrepris d'étudier les aspects agronomiques, pas assez connus, du chou fourrager et de connaître les conditions les plus favorables à son développement.

Le chou fourrager, famille des crucifères, est parfaitement adapté au climat de l'Est et fort apprécié des animaux Sa rusticité, sa forte digestibilité (80%) et ses rendements élevés donnent le maximum de protéines digestibles par unité de surface (1120 kg/ha) (½ tonne/acre)

La valeur de l'azote pour de bons rendements était déjà connue, mais ce chou accumule facilement les nitrates et peut devenir toxique si le sol est trop fertilisé La fumure azotée doit être dosée pour subvenir aux besoins de la plante sans la rendre dangereuse pour la consommation animale.

Les essais démontrent que le taux de 120 kg d'azote à l'hectare (107 lb/acre), a donné les meilleurs rendements en matière sèche, la teneur en nitrate est sans danger

Simultanément les chercheurs se sont livrés à une expérience sur les dates de semis et de récolte. Le froid a peu d'effet sur le chou: jusqu'à —4°C (20°F), la plante ne s'affaisse pas et continue même à pousser le lendemain d'une gelée (—2°C) (28°F) si la température est assez chaude Les observations le confirment puisque une récolte du 8 octobre était 20% plus élevée en MS que celle du 15 septembre.

Il semble également préférable d'ensemencer tôt au printemps et de récolter à la date la plus tardive, car le niveau de nitrate diminue avec la maturité

L'effet bénéfique de cette plante sur la production du lait a déjà été démontré, mais une ration trop élevée peut anémier les ruminants On suggère une ration de 1.2 kg de matière sèche par 100 kg de poids vif (1 2 lb par 100 lb)

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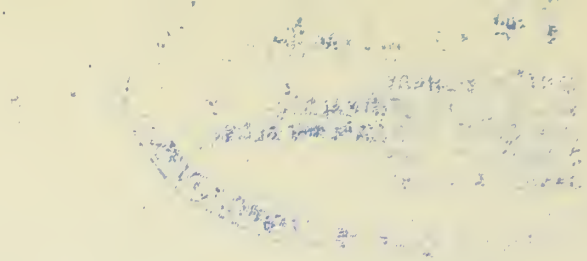

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