Research FOR FARMERS

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Cover Photo: **Buried tanks and Bellani plate atmometers used to measure evaporation; technician reading tensiometer, an instrument used to determine soil moisture. (See "Irrigation Scheduling", p. 4).**

NOTES AND COMMENTS

Do baby pigs need water? So far as the suckling pig is concerned little is known of its ability to consume water, or of its need. Dr. D. W. Friend (page 3) unfolds some preliminary results that are interesting and encouraging. He reports that consumption during the seventh week was about 780 gm. of creep feed per piglet when no water was provided, compared with 1310 gm. for piglets allowed water or sweetened water. The liveweight gain of the control piglets from 5 to 7 weeks of age, averaged 18 per cent less than that of the other piglets. Research is continuing.

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E. H. Hobbs and L. G. Sonmor (page 4) report on an irrigation scheduling method that has been judged to be fully reliable, after several years of careful checking through experiments at the Lethbridge Research Station.

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Dr. R. Paquin (page 6) describes research at La Pocatière, Que., aimed at controlling potato blight . . . Studies by Lawrence and Ashford (p. 8) at Swift Current indicate that the removal of aftermath forage is necessary if seed yields of Russian wild ryegrass are to be maintained at a high level . . . Dr. Andrew S. Greig (p. 10) reports on the baby pig encephalomyelitis situation. Studies to date indicate a wider spread of this disease in pigs than was first recognized . . . Dr. Gourley (p. 12) discusses the importance of disease control in strawberries; W. L. Pringle (p. 13) unfolds a success story concerning a machine for range revegetation; Dr. M. N. Grant (p. 15) writes about Winalta, a new hard red spring winter wheat which has excellent milling and baking qualities. Incidentally, considerable interest has been shown in Winalta by farmers and research workers in the northern part of the United States, and requests for seed have come from the United Kingdom, the Scandinavian countries, northern Europe, and the U.S.S.R.

Preliminary Results Encouraging . . .

Do Baby Pigs Need Water?

D. W. Friend

Creep area equipped with self-feeder and water dispenser.

MANY studies have shown a direct relationship between feed and water intakes in several species of animal, including the pig. However, so far as the suckling piglet is concerned, little is known of its ability to consume water, or in fact of its need. At the CDA Experimental Farm, Nappan, N.S. we are currently investigating this aspect of pig nutrition.

The project is designed to measure the effect of supplying water in the creep, on the consumption of feed by a litter and its rate of liveweight gain. The sows' ration was fed as a slop by mixing with 3 times its weight of water at each of 2 feeds daily. The sows received no other feed or water and their litters were confined to the creep while the sows were eating. Each creep area was provided with electric floor-heating, electric light, a pelleted creep feed in a self-feeder and a special, valveless water-dispenser for baby pigs.

Dr. Friend is a specialist in animal nutrition, CDA Experimental Farm, Nappan, N. S.

The dispenser was designed to meet the following three essential requirements: (a) to supply fresh, clean water, (b) to allow gravimetric determination of daily water consumption and (c) to be efficient, inexpensive and simple in structure. The dispenser was weighed each morning, cleaned and refilled. The weight of water consumed the previous day was calculated by difference.

Another Feature

Another feature of the experiment was the use of a sugar solution in place of water for some of the litters. The baby pig's energy requirement is known to increase rapidly after birth and has been estimated to outstrip, when 2 or 3 weeks old, the energy supply from the dam's milk alone. From our observations, there is no doubt that piglets like sweetened water. Even on the fourth day of age, the suckling piglets supplied with sugar solution in the creep, drank more than did those given water only (21 gm. compared with 15 gm. per piglet). By the end of the seventh week, average daily consumption had risen to close to 1300 gm. sugar solution and 830 gm. water per piglet respectively.

When we compared these two groups with a control group of piglets for which neither water nor sugar solution was provided, our research indicated the baby pig's need for fluid in addition to the milk of its dam. Preliminary results showed that from about 3 weeks of age, the control piglets ate less creep feed than those in either of the other two groups. The consumption during the seventh week was about 780 gm. of creep feed per piglet when no water was provided, compared with 1310 gm. for piglets allowed water or the sugar solution. The liveweight gain of the control piglets from 5 to 7 weeks of age, averaged 18 per cent less than that of the other piglets.

The foregoing results, while preliminary, are interesting and encouraging. But we still have much to learn about a suckling piglet's ability to consume water, or in fact of its need. Our research studies on this aspect of pig nutrition are continuing.

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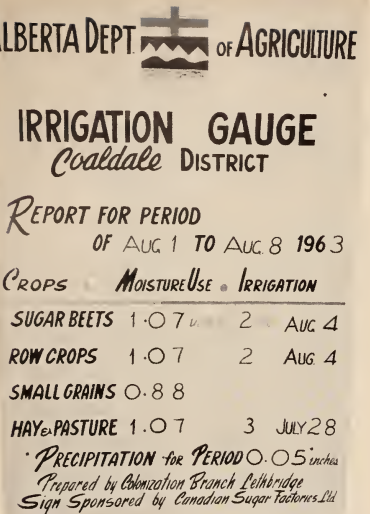


Irrigation scheduling signboard, a familiar sight in southern Alberta.

When to Irrigate, How Much Water to Apply . . .

IRRIGATION SCHEDULING

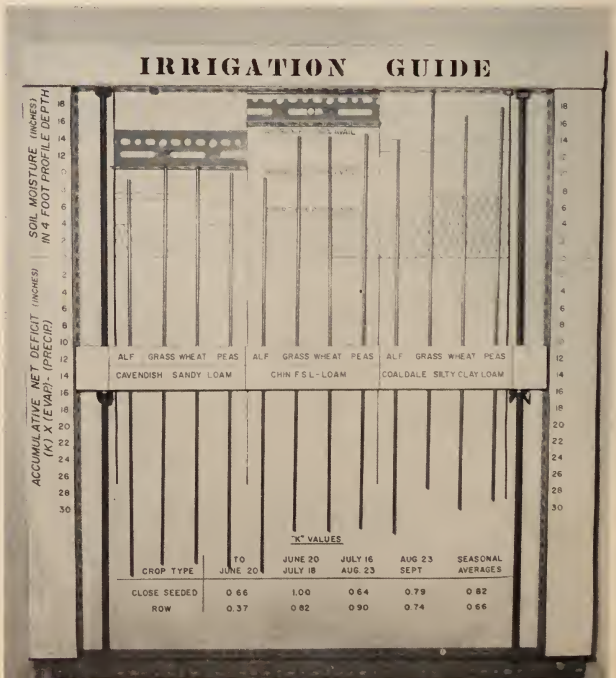
E. H. Hobbs AND *L. G. Sonmor*

When to irrigate and how much water to apply for maximum yields is a critical, recurring question for all irrigation farmers. For farmers of southern Alberta, a day-to-day answer now is available. The CDA Research Station at Lethbridge, Alta., has provided the necessary research information and the Provincial Extension Service is using this to provide an 'Irrigation Gauge' for scheduling irrigation.

Before irrigation requirements of crops can be calculated and irrigation scheduling attempted, the moisture content of the soil and the rate of moisture use by the crop must be known. There are numerous methods of measuring soil moisture. Those commonly used in research are based on one of several facts: that the conductance of a soil to an electric current varies with moisture content; that the suction exerted in a soil increases as the soil becomes drier; that the number of hydrogen ions in the soil, and hence its water content, can be measured with neutron scattering equipment; and that moisture can be driven from a sample of soil by heating it in an oven. Although these are adequate methods for the research worker, the cost or the labor involved makes them impractical for each farmer to use on his individual fields. Consequently, the best approach to irrigation scheduling seemed to lie in a method operated from a central location by a single agency.

In our investigations at the Lethbridge Research Station, we first determined the seasonal evapotranspiration (amount of water required to grow a crop at maximum yield) and time of season the water was required. This was done over a period of years for 13 of the crops most commonly grown in this area. However, since no two growing seasons are exactly alike and, indeed, may differ widely, this crop water use record

A prototype irrigation scheduling device developed during the research program.



Mr. Hobbs is an agricultural engineer with the CDA Research Station, Lethbridge, Alta. Mr. Sonmor is an agronomist, formerly with the Lethbridge Station, now with the CDA Research Station, Saskatoon, Sask.

was of little practical value to irrigators. But, if the water requirements could be related to some climatic factor, the seasonal variations could be taken care of. Our next step, therefore, was to compare the rate of crop water use with that at which evaporation occurred from an evaporation pan and from other evaporimeters. As had been shown elsewhere, a definite relationship exists between these two factors. Thus, it became possible to predict plant water requirements by measuring evaporation, and an irrigation scheduling procedure had become a reality for this area.

There were some further problems. All crops did not behave alike in their water-use pattern, some appearing to require more water than others. It was found, however, that they could be grouped into three broad categories: forages, cereals, and row crops. The essential difference seemed to be whether or not the crop foliage provided a complete ground cover. Thus cereals, later on in the season when plant growth approached a maximum, behaved in a manner similar to the forages.

Another factor requiring consideration was that the water use: evaporation ratio was not constant throughout the season. In the early part of the season, when plant growth was limited, the ratio was much less than unity. As growth progressed the relationship increased to about one to one, and this rate either was maintained for the remainder of the season or decreased somewhat with the approach of crop maturity. It was necessary, therefore, to alter the ratio as the season progressed.

The irrigation scheduling method was now carefully checked out over several years. Each spring the soil moisture content was determined as a necessary starting point for the schedule. Evaporation was measured daily. Previously determined water use: evaporation ratios, pertinent to crop type and stage of growth, were used to adjust the measured evaporation amounts. Irrigation was applied according to this modified evaporation rate schedule. When rainfall occurred, adjustments were made accordingly. Throughout each year the soil moisture content of the test area was measured to ensure that the schedule was maintaining a moisture regime adequate for optimum plant growth. At the conclusion of the trial period this method of irrigation scheduling was judged to be fully reliable.

Irrigated test plots, Lethbridge Research Station.

With this background, it was time for the Provincial Irrigation Extension Service to adapt the method for extension purposes. Very little modification in procedures has been required. To make allowance for variations in precipitation and evaporation, data are secured at several widely spaced locations. Because of convenience, evaporation is measured with a porous ceramic evaporimeter (Bellani plate) rather than with an evaporation pan. These evaporation data for each area are modified by multiplying them by the appropriate ratios determined at the Research Station. The figures, which now represent inches of plant water use, are compiled in a manner somewhat similar to a bank balance. They are added together day by day. Rainfall is subtracted. When the total reaches the amount required for the next irrigation—perhaps 3 inches—farmers are advised and the operation is resumed, starting again at zero. This information, as well as being published by the local press and carried on a T.V. program, is illustrated on 'Irrigation Gauges' prominently posted in each area. In this way farmers in each district are informed how much evapotranspiration has occurred during the past week and whether their crops are likely to require an irrigation.

Work at the Research Station continues. More crops are being studied to add to the present list, water use is being determined with increasing precision, and some modification in the existing recommendations may be required. The influence of fertility on water use is receiving attention. Meanwhile, the irrigation scheduling program is providing a useful service to the farmers in the irrigated areas of southern Alberta.

Fig. 1.—Représentation schématique de la roue distributrice de la planteuse et des pointes ou clous à pics. Les tubercules ou parties de tubercules (éclats) se fixent sur les pointes pour une distribution uniforme sur le rang. Les pointes sont de trois longueurs, 13/16", 1 1/16" et 1 5/16", suivant la grosseur des éclats et constituent l'un des principaux agents de dissémination des maladies (Photo fournie par Oliver Corporation).

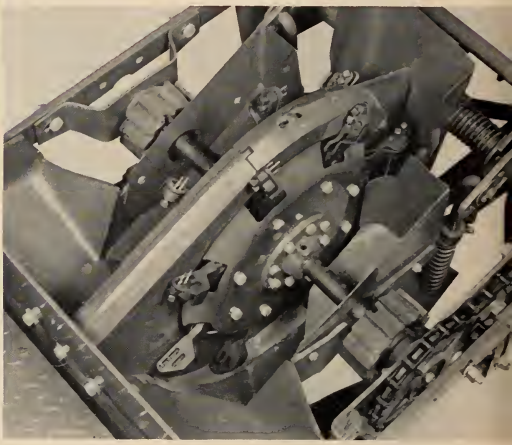


Fig. 2.—Vue des chaînes et des godets distributeurs sur la planteuse à godets. C'est probablement la planteuse qui offre le moins de danger de contaminations et de meurtrissures des tubercules.

Comment lutter contre la flétrissure bactérienne de la pomme de terre

R. Paquin

APRÈS plusieurs années d'expériences et d'essais, l'équipe de chercheurs de la Station de Recherches de La Pocatière a réussi à démontrer que les mesures sanitaires et l'emploi de variétés résistantes ne sont pas des moyens suffisants à eux seuls pour lutter efficacement contre la flétrissure bactérienne. Il faudrait y joindre l'usage de tubercules entiers comme semence. C'est une bonne vieille méthode encore utilisée en Europe et rendue obligatoire dans certains pays.

Nous savons tous que la pomme de terre peut être multipliée de deux façons, soit par les tubercules, soit par la graine. Peu de variétés produisent des graines, et le plus souvent en petite quantité. Les tubercules peuvent être semés tels quels, c'est-à-dire entiers, ou peuvent être éclatés pour augmenter la quantité de semence. Cependant, l'éclatement des tubercules qui est la méthode communément utilisée en Amérique du Nord pose le problème de la dissémination par le couteau, des maladies telles que la jambe noire (*Erwinia atroseptica*) et la flétrissure bactérienne (*Corynebacterium sepedonicum*). La dissémination de la flétrissure est très grave. On peut relire à ce sujet l'article de notre collègue, Henri Généreux, paru dans le vol. 9, nº 1 de cette revue. Face à ce problème, nous avons donc entrepris à notre Station de Recherches de La Pocatière il y a quelques années une étude systématique des moyens de lutter contre cette redoutable maladie.

Dr Paquin est phytophysiologist à la Station de Recherches, Ministère de l'Agriculture du Canada, La Pocatière (Québec).

Les mesures sanitaires

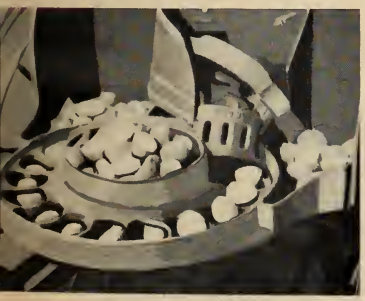
Parmi les mesures sanitaires, il faut inclure la désinfection de la semence (germes ou éclats) et celle du couteau, des outils, des instruments tels que la planteuse et des contenants. Nous avons sélectionné suivant leurs propriétés bactériostatiques et bactéricides, plus de 100 produits chimiques, y compris des composés à base de mercure et d'ammonium quaternaire, des détergents, des désinfectants et des antibiotiques. Ces substances ont été mises à l'essai en laboratoire et dans le champ contre la flétrissure bactérienne.

Dans la désinfection des éclats, seuls quelques antibiotiques comme la streptomycine, la vancomycine, la phytomycine, l'agrimycine et la mikamycine se sont montrés

efficaces. Cependant, pour éliminer complètement la maladie, il fallut augmenter la durée du traitement de 3 à 6 heures dans les solutions contenant 1 à 2 parties par mille de substance. En plus d'être coûteux, un tel traitement n'est pas pratique, même si dans quelques cas il a contribué à augmenter légèrement le rendement. De plus, ces antibiotiques sont pour la plupart absents du marché. Bien que moins efficace, le bichlorure de mercure acidifié ($HgCl_2$, 2:1000 + 1% HCl/10 minutes) fut pendant longtemps notre seul agent qui offrit des propriétés thérapeutiques intéressantes. Malheureusement, ses propriétés toxiques et corrosives en font un produit de manutention délicate et peu recommandable. La formaline fut notre meilleur agent en laboratoire en inhibant complètement la croissance de l'organisme pathogène cultivé sur gélose, mais s'avéra un piètre désinfectant des éclats contaminés.

Plusieurs produits offrirent une excellente désinfection mais diminuèrent considérablement le pouvoir germinatif de la semence. Ces expériences nous ont convaincu qu'à moins de trouver une substance miracle qui, en plus de n'être pas toxique pour la germination, protégerait les éclats contre les contaminations, exigerait une durée de trempage relativement courte et serait peu dispendieuse, il ne fait pas de doute que la désinfection des éclats ne sera jamais une mesure sanitaire populaire.

Fig. 3.—Vue de la table distributrice et des trous qui entraînent les tubercules ou éclats. Le danger des meurtrissures est plus grand que chez la planteuse à godets et la distribution moins uniforme, mais le danger de contamination est beaucoup moindre que chez la planteuse à pics.



La désinfection du couteau, le principal agent de dissémination, et celle des instruments et des contenants (sacs, boîtes, etc.) est un traitement relativement facile et efficace, le pouvoir germinatif n'étant pas mis en cause. Les meilleurs résultats ont été obtenus avec un trempage de 1 à 5 minutes dans les solutions d'eau de Javel (1:3) et de crésanol (1:4) ce qui a été suffisant pour décontaminer le couteau complètement. Les antibiotiques qui sont de pauvres germicides en général ont été peu efficaces. La désinfection du couteau a l'inconvénient de ralentir le travail de l'éclatement des tubercules et ne protège pas complètement les éclats contre les pourritures du sol et la contamination par les instruments et les contenants.

Pour la désinfection des planteuses, surtout de la planteuse à table, nous avons obtenu d'excellents résultats avec l'eau de Javel (1:2), la teramine (1 chopine/35 gallons), le Germ-i-tol (1½ oz./gallon) et la vapeur sèche (100 livres de pression). Il sera toujours recommandable de nettoyer la planteuse et de la désinfecter au moment de la plantation ou chaque fois qu'on l'aura prêtée à un voisin. Cependant, cette mesure sanitaire a été inutile avec la planteuse à pics lorsque la semence de tubercules entiers ou éclatés était infectée. Elle a été utile avec le planteur à table ou à godets seulement quand le couteau fut désinfecté au préalable. L'emploi du planteur à pics annule les bons effets de la désinfection des éclats et du couteau à cause de la contamination certaine des pics qui pénètrent à l'intérieur des tissus (Figure 1). La première mesure de prévention est donc d'éliminer complètement du marché la planteuse à pics et tout autre instrument du même genre (Figure 2 et 3). On pourrait ajouter à ceci l'emploi d'une semence certifiée.

L'emploi des variétés résistantes

Malgré les efforts de nombreaux chercheurs tant au Canada qu'aux États-Unis, l'on a pas réussi à créer des variétés immunes ou complètement résistantes à la flétrissure bactérienne. C'est ainsi qu'à notre Station de Recherches, on a pu démontrer que les tiges des variétés les plus résistantes contenaient les bactéries de la flétrissure sans pour autant montrer les symptômes extérieurs de cette maladie. Les quelques variétés qui ont vu le jour n'ont pas trouvé la faveur du public concommateur ou n'ont pas été acceptées par le producteur pour différentes raisons. D'autre part, il existe d'autres maladies de la pomme de terre par exemple, les maladies à virus, contre lesquelles la lutte n'est possible que par la création de variétés résistantes. Ne vaut-il pas mieux réserver ce moyen de lutte contre les virus puisqu'il semble utopique de croire que l'on pourra jamais atteindre un jour cet idéal: créer une variété résistante à toutes les maladies et réunissant les qualités culinaires exigées par la ménagère.

La semence de petits tubercules entiers

La pelure de la pomme de terre offre une barrière naturelle à la contamination par les mains, les outils et le sol. L'éclatement du tubercule enlève cette barrière et ouvre la porte à l'infection. Un tubercule atteint de flétrissure bactérienne a peu de chance de contaminer les autres, s'il n'est pas coupé ou meurtri. Théoriquement, un tubercule gravement infecté pourrira dans le sol durant la croissance, ne laissant pas de trace, ou produira des tubercules très infectés qui pourront être éliminés lors de la récolte. Le tubercule atteint légèrement pourra produire des tubercules plus ou moins infectés qui pourront être éliminés la première année ou les années subséquentes. Certaines expériences nous ont permis de constater que la maladie pouvait s'éliminer d'elle-même. Malheureusement, il y a des exceptions et certains essais nous ont

Suite à la page 14

Fig. 1.—Single plant of Russian wild ryegrass showing basal type of leaf growth.

Swift Current Scientists Clarify a Situation . . .

Russian Wild Ryegrass

A Dual-Purpose Crop

T. Lawrence AND *R. Ashford*

RUSSIAN WILD RYEGRASS, *Elymus junceus* Fisch., is an ideal dual-purpose crop in that stands grown for seed can also be relied upon to provide excellent late summer and fall pasture, in the brown and black soil zones of Western Canada.

Three factors combine to make this grass especially useful as a dual-purpose crop. First, the growth habit of Russian wild ryegrass, to produce seed on long leafless culms, makes it unsuitable for hay but allows the seed grower to harvest the seed without disturbing the leafy aftermath (Fig. 1). Second, Russian wild ryegrass cures well on the stem, that is, it retains its form and most of its nutrients for several months after growth ceases. These excellent curing qualities result in good livestock gains late in the year when the feed value of most other grasses is low. Third, the removal of aftermath forage from seed production fields is essential for good seed production. The significance of the first two factors has been recognized for several years. However, the importance of the third factor was only recently pointed out by research at the Swift Current Experimental Farm. It has been shown that seed yields are depressed if the aftermath is allowed to persist from year to year. Aftermath removal is a departure from the usual type of management recommended for grass seed production. In fact, results obtained with other grasses indicate that seed yields usually are decreased if the stubble is grazed.

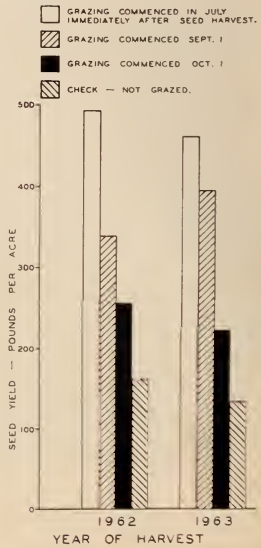
In our investigations at Swift Current, we established a test to clarify the situation with respect to Russian wild ryegrass. We studied the effect of grazing after seed harvest on subsequent seed crops in a replicated field trial through several seasons. The test was seeded in 1958 in rows spaced 3 feet apart. Grazing treatments were commenced after seed harvest in 1959. Seed yields were not obtained in 1960 and 1961 because of drought but the stand was grazed according to plan. To reduce drought effects, the test was sprinkler irrigated in the fall of 1961, and each spring and fall thereafter, with approximately 4 inches of water per irrigation.

The 1962 and 1963 seed yields shown graphically in Figure 2 indicate the increased seed yield resulting from late summer and fall grazing. The sooner grazing commenced after seed harvest, the greater the increase in subsequent seed yields. When grazing was started immediately after seed harvest, the yield was in excess of 3 times that obtained from ungrazed grass.

Sheep were used to carry out the grazing treatments and stands would be classified as severely overgrazed by most range specialists (Fig. 3). The aftermath forage gave an annual carrying capacity of 640 sheep days per acre from 1959 through 1962.

In the final year of the test, we attempted to determine why grazing the aftermath forage from Russian wild ryegrass resulted in increased seed yields in subsequent years. We conducted studies on individual plants to determine the effect of grazing on the morphological development. Tillers taken at random from grazed and ungrazed plants in April, 1963, shortly after the start of spring growth, were dissected and examined under a stereoscopic microscope. A large percentage of frost-

Fig. 2.—1962 and 1963 seed yields of Russian wild ryegrass as influenced by grazing.



Dr. Lawrence is a plant breeder and Mr. Ashford is an agronomist with the Forage Crops Section, CDA Experimental Farm, Swift Current, Sask.

Fig. 3.—View of experiment; *left foreground*—grazed, *right*—not grazed. Intensity of grazing is indicated as well as amount of aftermath on ungrazed plots.

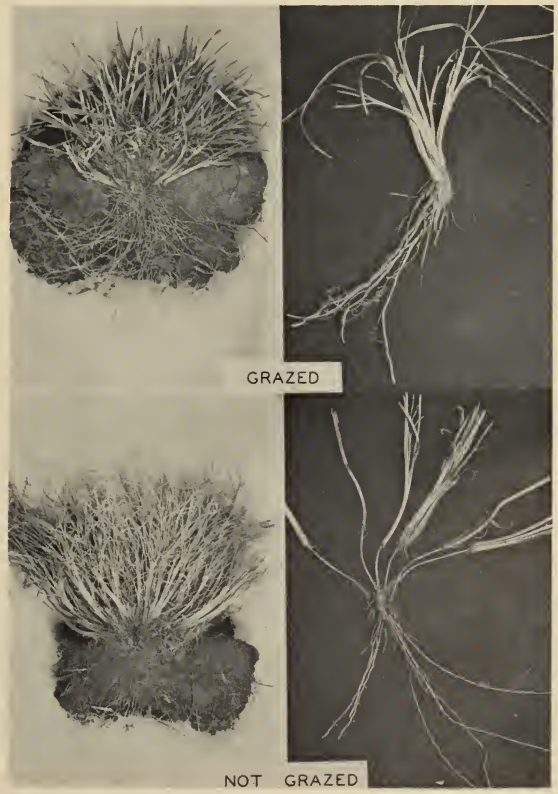
damaged growing points, or apices, were observed in ungrazed plants while none were found in plants that had been grazed. The damaged apices appeared to be in an advanced stage of floral development although they lacked the structural definition of healthy growing points. A distinct brown ring was apparent at the crown of frozen apices while immature leaves proximate to the frosted apices were discolored. Counts were made on sufficient tillers collected at random to show conclusively that higher seed yields from grazed plants could be attributed to the increased survival of shoot apices.

A record was kept of mesocotyl development as it related to various tillers at the time of dissection. The mesocotyl may be defined as that portion of a mature plant lying between the area where the main root system is attached to the axis of the plant, and the crown where the growing points or apices are situated and from which the leaves and seed stalks arise (lower right hand photograph in Fig. 4). Measurement of mesocotyls on samples from ungrazed plots showed an average length of 45 mm. while tillers from grazed plants had an average mesocotyl length of 10 mm. Frost-damaged apices generally occurred in tillers with mesocotyls in excess of 40 mm. in length.

An examination of vertical cross sections through plant rows (Fig. 4) showed that the shoot apices of ungrazed plants were elevated by the extensive mesocotyl growth to above ground level where they became susceptible to frost damage in the winter or early spring. Apices in grazed plants were usually situated below the ground surface and were protected and unharmed. The pronounced development of mesocotyls was associated with the build-up of leaf and stem material in the ungrazed rows, and is likely a response to low light intensity at the crown of the plants.

The results of these studies indicate that the removal of aftermath forage is necessary if seed yields of Russian wild ryegrass are to be maintained at a high level. Removal of the aftermath by grazing serves a dual role. Not only does it benefit seed yields, but it allows the seed grower to make the best use of the aftermath. The conversion of the aftermath into marketable animal products provides the grower with another source of income. This additional income is a valuable supplement to the farm economy even in good seed crop years. However, it will serve an even more important role in the event of a seed crop failure when it will act as a safeguard against complete loss of revenue from the Russian wild ryegrass stand.

Fig. 4.—Cross sections and individual plants of grazed and ungrazed Russian wild ryegrass showing extent of mesocotyl development and location of shoot apices in relation to ground level.



Pigs showing signs of viral encephalomyelitis.

Andrew S. Greig

Viral Encephalomyelitis in Ontario Pigs

About four years ago reports began to appear in Canadian Veterinary literature on the occurrence of a disease among baby pigs in Ontario which resembled the porcine encephalomyelitis known as Teschen disease. The condition was confined to suckling pigs and was reported in the eastern and western parts of the province. Affected animals showed a variety of signs of severe nervous disorder such as vomiting, incoordination, hypersensitivity and excessive squealing in addition to general symptons of disease including weakness, loss of appetite, occasional high temperature and intestinal upset. These symptons generally appeared a few days after birth and involved whole litters. The course ranged from two days to two weeks with the animals progressively weakening, then eventually becoming comatose before death. The death rate among affected pigs was high, but it was seldom that more than one or two litters on any single premise became infected.

Our examinations of affected piglets failed to reveal any gross pathological abnormalities, but microscopic studies of the brain showed lesions associated with a viral encephalomyelitis. Veterinary literature included very few conditions which presented such a clinical and histopathological history. The most obvious similarity was to Teschen disease, sometimes called pig poliomyelitis. The causative viruses of Teschen disease and human poliomyelitis are unrelated but both are classed as enteroviruses since their normal habitat is the intestinal tract.

Since it was first reported in the Teschen district of Czechoslovakia in 1929, extensive outbreaks of Teschen disease with heavy losses have occurred in Hungary, Germany, Poland and Italy. Indeed the damage from Teschen disease was so severe that many countries, including Canada, took legislative measures to prevent entry of some pork products from known infected areas.

About the time encephalomyelitis was first observed in Ontario, a similar condition appeared in Britain and Denmark caused by viruses closely related to that of Teschen disease. The main difference was in the severity of the disease produced. Talfan disease as it was called in Britain and polioencephalomyelitis suum in Denmark were both more chronic and milder in effect than Teschen.

Naturally, the appearance in Canada of a Teschen-like disease caused concern in the Health of Animals Branch, particularly in view of our close trading relationships with England. Teschen in Canada could seriously affect our pig industry, not only through the losses which might occur due to the infection itself, but more importantly through the potential loss of export rights to countries which, like Canada, have laws which for their own protection discriminate against Teschen-infected areas.

Studies were immediately undertaken at the Animal Disease Research Institute on the clinical, histopathological and virological aspects of the Ontario baby pig disease. These studies soon revealed that the Ontario disease, in spite of its resemblance to Teschen disease, was, in fact, a different infection not previously described in Veterinary literature.

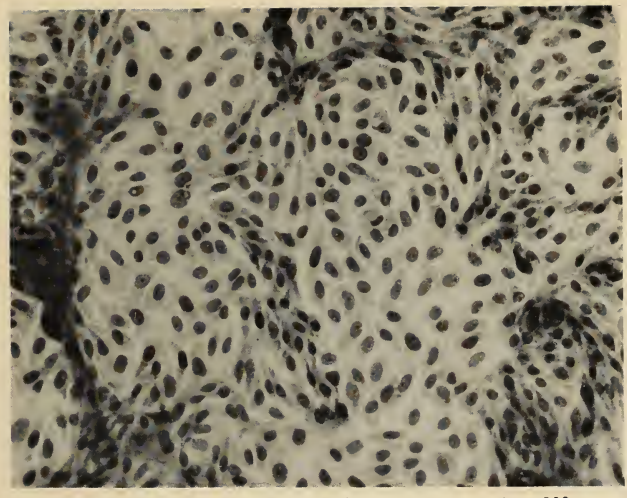
In the first place, clinical comparisons between Teschen and the Ontario disease showed that whereas Teschen affects pigs of any age and is usually seen in animals four months of age or older, the Ontario disease appeared to be confined to pigs under two weeks of age. Talfan and polioencephalomyelitis suum infect principally weanling pigs. In comparative histopathological examinations, it was seen that Teschen disease virus produced much more

Dr. Greig is a specialist with the Virology Unit, Animal Pathology Division, Health of Animals Branch, Animal Diseases Research Institute, Hull, Que.

severe brain damage than the Ontario infection and in addition produced lesions in different parts of the spinal cord.

The final proof that the Ontario baby pig encephalomyelitis was not one of the Teschen-Talfan-polio-encephalomyelitis suum group of diseases was the isolation of a virus from material from a field case of the Ontario disease. This virus had two immediately evident properties which distinguished it from Teschen virus. One was its formation in pig kidney tissue cultures of characteristic multinucleated giant cells which are markedly different from anything produced in culture by Teschen or related viruses. The second property was the development in the culture of viral substances capable of agglutinating red blood cells from chickens, rabbits, hamsters and sheep. This property of blood agglutination, hemagglutination, was emphasized in the tentative naming of the new agent "Hemagglutinating Encephalomyelitis Virus (HEV)".

It was found that the hemagglutination reaction could be inhibited or prevented by the addition of blood serum from pigs which had survived the Ontario encephalomyelitis. This indicated that these convalescent sera contained specific antibodies for HEV. Furthermore, since the hemagglutination-inhibition test is specific for detecting antibodies to HEV, it also showed conclusively that HEV was completely unrelated to Teschen disease virus, or in fact, to any previously reported pig disease agent. This serological test also indicated that antibodies to HEV were to be found in pigs from Quebec and Alberta as well as Ontario. In Ontario, for example, as many as 30 percent of apparently normal pigs had antibodies to the disease, indicating a high rate of previous exposure to this virus.

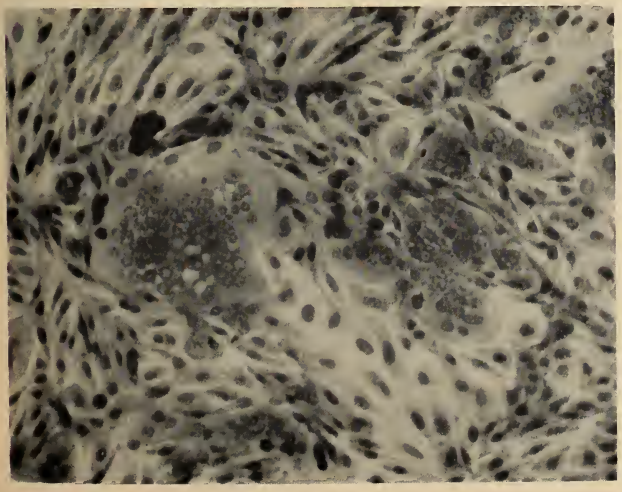


Five-day-old culture of cells from the kidneys of a young pig x100.

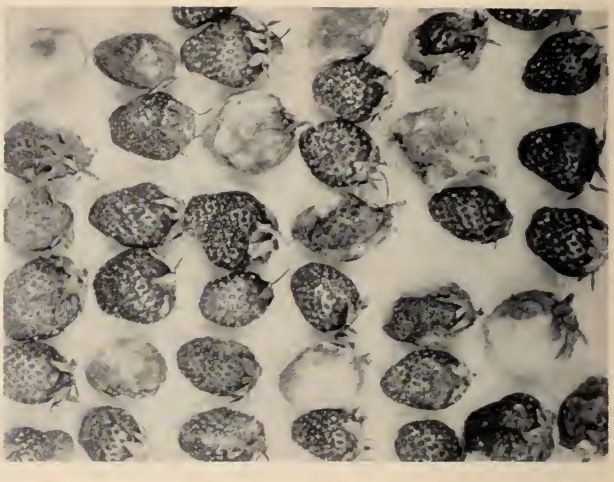
HEV, although highly lethal for baby pigs unprotected by antibodies, appears to be a more self-limiting condition than Teschen disease. It is confined to suckling pigs. Older animals, when exposed to the virus, either fail to show any evidence of disease or, at most, experience only a transient illness. However, all exposed animals rapidly build up antibodies which, secreted in the colostrum of sows, serve to protect subsequent litters. This combination of factors tends to keep herd mortality at a much lower level than would be expected if Teschen disease were to enter our pig population.

Studies have continued and are still in progress on the many facets involved in characterizing and identifying a new agent such as HEV. To date, the virus has been isolated from 16 outbreaks, and serological evidence has been shown in over 40 other cases of baby pig encephalomyelitis. Vigilance is still being maintained in our watch for Teschen since it still represents a threat not to be overlooked. However, HEV is of immediate concern and all studies to date indicate a wider spread of the infection than was first recognized.

Five-day-old pig kidney tissue culture infected with Hemagglutinating Encephalomyelitis Virus. Note areas of giant-cell formation.



Fungicide trial on strawberries.



Grey mold fruit rot after 4 days at room temperature on berries which showed no infection when picked.

Disease Control in Strawberry Production

C. O. Gourley

During the past few years at the CDA Research Station, Kentville, N.S., we have been studying fungicide sprays for the control of fruit and foliage diseases of strawberry. The increased plant vigor and larger yields obtained with strawberry plants free of virus diseases has resulted in a more general use of fungicides to control other diseases affecting this crop. We have found that one of the most destructive of these diseases is gray mold fruit rot caused by the fungus *Botrytis cinerea* Pers.

Because commercially harvested fruit often breaks down with gray mold fruit rot within three days after being picked, we conducted tests to see if the amount of fruit rot in four commercial fields could be correlated with the type of culture or control practiced. Soil moisture in the four fields was augmented by overhead irrigation prior to harvest. We found that the fields with the heaviest plant growth (Table 1) had the highest percentage of rot. We were surprised to see that the field with only a thin stand of plants which had received no fungicidal control sprays had less rot than fields with a more dense stand of plants. We are convinced that the more vigorous and dense the plant growth the greater the volume and concentration of fungicide required to obtain maximum control of disease.

We set up experimental plots at the Research Station to study the effect of the fungicides captan and thiram for the control of gray mold fruit rot. Our results showed that varieties differed in their susceptibility to this disease, i.e. Catskill and Redcoat were more susceptible than Cavalier and Sparkle. Varieties also differed in their reaction to the fungicides. Our records showed that less gray mold occurred on Cavalier and Sparkle sprayed with captan and on Catskill and Redcoat sprayed with thiram. These differences in varietal susceptibility and reaction to fungicides may explain the conflicting reports on fungicides tested for the control of gray mold over a wide range of varieties.

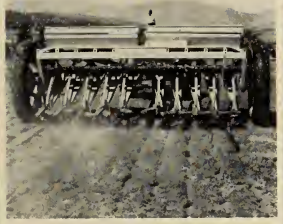
The problem in the control of gray mold fruit rot is emphasized when the pattern of fruit infection is considered in relation to the biology of the parasite. This fungus generally sporulates on organic debris, especially during the

Concluded on page 14

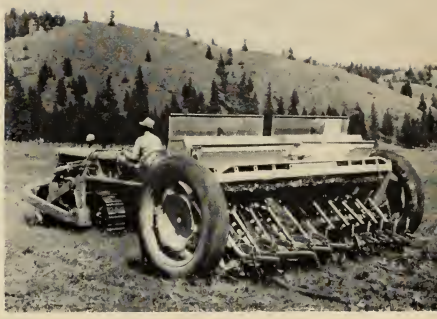
Table 1. EFFECT OF CULTURAL AND CONTROL CONDITIONS ON *BOTRYTIS* ROT OF HARVESTED FRUIT

Field	Plant stand	No. of sprays applied	Percent rot after four days
1	very dense	5	64
2	dense	4	59
3	moderate	5	28
4	thin	0	56

The author is a plant pathologist at the CDA Research Station, Kentville, N.S.



Seeding depleted grasslands with the Oregon Rangeland Drill. Each 20-inch disc is on a pivoted arm and has sufficient weight to carve a furrow even in uncultivated rangeland.



Successful Machine For Once-over Rough Seeding . . .

A New Tool for Range Revegetation

W. L. Pringle

THE rangeland of interior British Columbia, like that in many other parts of North America, evolved without direct grazing pressure from livestock. When this pressure was applied too heavily, our native plants were unable to survive and less palatable weedy species replaced them. In other words, our ranges were overgrazed. In some cases, it is too late to bring overgrazed ranges back to full productivity, by practising the techniques of rest, grazing rotation, and proper stocking rates. According to our research records at the CDA Research Station, Kamloops, B.C., it takes about 30 years to rehabilitate a depleted grassland by these methods. At the same time, the need for grass increases and we cannot afford to wait. The only alternative is range revegetation with grasses adapted to the area and capable of withstanding grazing pressure. For the most part, these are such species as crested wheatgrass and Russian wild ryegrass that evolved with domestic stock on the steppes of Russia and central Asia.

The author is a field husbandry specialist at CDA Research Station, Kamloops, B.C.

In our investigations at Kamloops, we have undertaken many small experimental range seedings using conventional equipment over many years. The first of these were seeded on sagebrush rangeland in 1936. The resulting crested wheat stands, measured over a 6-year period (1951-1957), averaged 465 pounds dry matter per acre compared with 189 pounds of native grass. The longevity of this stand points up that we are not dealing with a short-term effect but that seeding transforms a range almost into perpetuity. A more recent crested wheatgrass seeding on an area representative of 10,000 acres of depleted crown range showed a 3-year average of 227 pounds per acre more forage than adjacent non-seeded range. Two other trials on depleted Indian reserve range gave 2-year average increases from crested wheatgrass of 826 and 1340 pounds per acre over the native forage.

The main problem in range reseeding has been the lack of a machine that could stand up to the job in rough mountain terrain and carry out a large-scale seeding successfully and economically. A rangeland drill, developed by the United States Department of Agriculture, seemed to be the answer to this problem, and in 1963 we decided to test this drill for adaptability to our conditions, to assess its value as a tool for use on our ranges, and to find out the costs for land rehabilitation. We arranged for the loan of such a machine from the U.S. Forest Service, and in co-operation with the B.C. Forest Service, we used it on five range types. Seeding was carried out in May and September. As can be seen from the accompanying photo, the machine is a

Successful Rangeland Drill

In the northwestern United States, public ranges were seriously abused and government agencies were given the task of restoring their productivity. Ranges are rough and equipment for seeding them must be strong and rugged, so the "rangeland drill" was born in 1952 in Oregon. It is now produced in California and is used generally throughout the ranges of the western United States, having successfully seeded several million acres in the past eight years.

'beefed' up grain drill that weighs 3000 pounds and is capable of traversing exceptionally rough ground, particularly if a crawler tractor is used. Discs are set one foot apart and angled so that the furrow is thrown to cover vegetative competition between each row. The seed is placed in the bottom of an open furrow and covered lightly by metal drags. This makes even slight amounts of precipitation available to the germinating seedling. For economic reasons, a once-over operation is desirable and can be accomplished at an average rate of 3 acres per hour, at a cost estimated between $4 and $5 per acre.

It has been shown that native grasslands, depending on rainfall, soil, and elevation, produce from 100 to 1000 pounds of oven-dry forage per acre per season. Increases of even 200 pounds per acre pay the cost of range seeding in only a few years. Not only does seeding greatly increase total long-term production but it allows for more intensive grazing without fear of injury to the range.

Although we have tested a rangeland drill on British Columbia grasslands and found it to be a most successful machine for a once-over rough seeding, we are doing further research on areas seeded at Kamloops to measure its ultimate value.

Comment lutter contre la flétrissure bactérienne de la pomme de terre . . . de la page 6

démontré que l'infection latente pouvait persister plusieurs années dans des tubercules apparemment sains.

La première règle que doit suivre le producteur est donc de se débarrasser d'une semence qui contient de la flétrissure, ne fut-ce qu'une fraction de 1%, et de commencer ou recommencer avec une semence certifiée, de classe «Elite» de préférence. A l'automne, ce même producteur doit éliminer une quantité de petits tubercules d'un diamètre inférieur à 2 ou 2¾ pouces qu'il doit faire consommer par les animaux ou laisser sur le champ. Ces petits tubercules pourraient être gardés en caveau et servir de semence le printemps suivant. Nous avons constaté avec d'autres chercheurs qu'à grosseur égale, une semence formée de tubercules entiers donne un meilleur rendement que celle de tubercules éclatés.

Les expériences poursuivies depuis plusieurs années à la Station de Recherches de La Pocatière nous permettent donc d'apporter les conclusions suivantes: le producteur a tout intérêt à semer des tubercules entiers. En plus d'éviter la propagation des maladies, il diminue les frais de désinfection et s'assure un meilleur rendement. De toute évidence, il doit éliminer la planteuse à pics ou tout instrument de même genre qui blesse le tubercule et favorise la dissémination des maladies (Figure 1). Si sa semence contient des traces de flétrissure, il doit la rejeter et recommencer à neuf avec une semence certifiée ou de classe «Elite».

Disease Control in Strawberry Production . . . from page 12

flowering and fruiting period of the strawberry. Research here and elsewhere has shown that the majority of fruit infections result from the penetration of hyphae growing from adhering infected organic fragments, such as moribund petals, pieces of straw and other debris. Lesser amounts of infection occur through contact with rotting fruit or through the calyx while very few result from spores germinating on the surface of the fruit. Strawberry floral parts may become infected at a very early stage in development but there may be no signs of the disease until the fruit begins to ripen.

The problem of controlling gray mold fruit rot is one of controlling flower infection from the closed bud stage onwards. But how important is this to the grower? Our research into the cost of producing strawberries has shown that it does not pay growers who expect yields in the vicinity of 1 to 2 tons per acre to apply a fungicide for fruit rot control. With expected yields of 2 to 4 tons per acre spraying may pay only in seasons when fruit rot is severe, and sprays must be applied as insurance against extreme losses. When yields of 4 tons or more per acre are expected growers will find that spraying for fruit rot control always is essential. By controlling gray mold fruit rot gross returns to the grower may be increased by as much as 37% (Table 2). This figure may be higher in a year when conditions are ideal for fruit rot development. The results of our experiments have shown the importance of early and regular applications of a fungicide from the first bloom stage onward. Because fruit rot develops most readily under warm moist conditions strawberries should be thoroughly protected with a fungicide prior to applying irrigation. It has been our experience in Nova Scotia that fungicides recommended for gray mold fruit rot will control other fungus diseases, except mildew, which may occur on the fruit and foliage.

TABLE 2. EFFECT OF FUNGICIDES ON PRODUCTION AND RETURNS* PER ACRE

	Yield in quarts	Gross return	Increase in gross return due to disease control
Sprayed	10,040	$2,510.00	$680.00
Unsprayed	7,320	1,830.00	

*Based on average (1959–62) returns in Nova Scotia of 25¢./qt. (fresh fruit).

WINALTA

A Hard Red Winter Wheat

M. N. Grant

A new Canadian hard red winter wheat has created increased interest in winter wheat production in Western Canada. This new variety excels in milling and baking qualities the old standard varieties Kharkov 22 M.C., Yogo, and Jones Fife (Silverchaff). It also has early maturity, shorter straw, and resistance to shattering.

Though winter wheat played a significant part in the opening of southern Alberta to wheat production, it has played a minor role during the past 50 years because of its relatively poor bread-making quality and the lack of sufficient winter hardiness, only to be replaced in the 1910-15 era by the spring wheat variety Marquis. For the past 50 years winter wheat, due to its poorer bread-making quality and the hazard of loss through insufficient winterhardiness, has been overshadowed by the spring crop. The development of high quality Winalta is a major step forward in making winter wheat competitive with spring wheat over a larger acreage in Western Canada. The improved competitive position can bring to more farmers the advantages that are associated with winter wheat production.

What are these advantages? Over the long term, winter wheat generally out-yields spring wheat by several bushels per acre. It is sown in the fall and matures before the spring wheat crop, thus spreading out the work load on the farm. A well-established winter wheat crop reduces the danger of soil erosion during the winter months. In addition, it competes more successfully with

Dr. Grant is a specialist in winter wheat breeding at the CDA Research Station, Lethbridge, Alta.

Author *(left)* and Dr. J. E. Andrews, now Superintendent, Brandon Experimental Farm, selected Winalta from thousands of winter wheat hybrids at Lethbridge Research Station.

wild oats than spring-sown crops do.

One of the disadvantages of winter wheat is its present level of winterhardiness, which restricts production to a relatively small part of southern Alberta and southwestern Saskatchewan. Another disadvantage is the susceptibility of all our winter wheats to the virus disease, wheat streak mosaic. Fortunately the spread of the virus can be controlled by using recommended seeding dates and cultural practices.

A heavy swath of Winalta near Pincher Creek, Alta.

Cross Made in 1949

Winalta was produced from the cross Minter × Wichita, made at the Lethbridge Research Station in 1949. The selection of winterhardy lines was carried out at Lethbridge and Edmonton. In the sixth generation, the lines still remaining were placed in a preliminary yield trial. The grain produced from the yield trials in this and ensuing years was tested in a rigorous assessment of milling and baking quality. The superior quality of line 4759-23 was immediately evident and was demonstrated repeatedly in succeeding years. Additional confirmation of the good agronomic type and high milling and baking quality of 4759-23 was obtained by extending the testing program to Experimental Farms at Lacombe and Swift Current.

Results from cold hardiness tests confirmed the fact that Winalta was in the same cold-hardiness class as Kharkov 22 M.C. and Yogo.

Winalta Licensed in 1961

After exhaustive tests from 1949 to 1961, the winter wheat known as 4759-23 was licensed and accepted for registration under the name 'Winalta'. Seed of this variety has been increased until now it is in fairly good supply. The development of breeder seed at Lethbridge was completed in 1962.

Considerable interest has been shown in Winalta by farmers and research workers in the northern part of the United States, and requests for seed have come from the United Kingdom, the Scandinavian countries, northern Europe, and the U.S.S.R.

Now that it has been shown that a high level of milling and baking quality can be obtained in winter wheat, the emphasis in the program has been shifted toward greater winterhardiness. When this goal is reached winter wheat will be able to expand over a sufficient acreage in western Canada to make it an important product for foreign export as well as domestic consumption.

Winter survival differences at Lethbridge were rated *from left to right:* Comanche 5%, Yogo 78%, Winalta 81%, Cheyenne 39%, and Jones Fife 6%.