

Quality in Winter Wheat.

In Eastern Canada comparatively little attention is paid to the hardness of the wheat sown. The average farmer seems to be content with seed that will give a high yield per acre, whether the kernels are hard and flinty or soft and starchy. Experiments conducted by H. F. Roberts and G. F. Freeman, of the Kansas Experiment Station, and published in Bulletin 156, show the value of selecting seed with the object of producing wheat of better grade. Discussing the yellow-berry problem in Kansas hard winter wheats, it is pointed out that the bulletin reviews the results obtained by other investigators of the yellow-berry problem and reports experiments conducted by the authors to determine the causes of this difficulty and means for their removal.

By the term "yellow berry" is meant the appearance of grains of a light yellow color, opaque, soft and starchy in hard winter wheats which normally produce a hard, flinty, translucent grain of medium size, and of a clear, dark reddish amber color. Sometimes only a part of the kernel will show the yellow-berry characteristics. It is pointed out that the data at hand indicate that the ordinary soft and starchy wheats of the Pacific Coast and the Middle and Southern States average somewhat higher in weight per bushel than the hard winter and spring wheats, and that the yellow berry in this respect does not resemble the soft wheats, the weight, as well as the specific gravity, falling below the flinty kernels of the same variety. This is considered as reducing the question to what extent the production of yellow berries is inherent in the variety and to what extent it is due to seasonal influences. In 21 varieties examined, the average weight of the yellow berries per 100 was 2.596 gm., and that of the hard, flinty grains 2.740 gm. The average specific gravity of the yellow berries was 1.304, and of the normal grains 1.336. It is known that the yellow berry contains less protein than the flinty kernel, and it is believed that the reduction in specific gravity is probably due to air cavities within the kernel, and possibly to a reduced starch content.

To determine the relation between the amount of yellow berry produced under the climatic conditions of the particular season, 128 varieties of wheat were grown during 1905-6 and 1906-7. The heads were harvested when considered fully ripe, and dried under cover, so that the existence of yellow berry could not be attributed to overripeness or exposure to the weather after cutting, but could only be ascribed to the influence of the weather before harvesting the heads or to inherent hereditary tendencies in the varieties themselves, or to both. Only clear kernels with a reddish amber color throughout were considered as normal grains, while those either wholly or in part yellowish, opaque and starchy were classified as yellow berries.

The mean temperature during the wheat vegetative season, September to June, inclusive, in 1905-6 was 51.33 degrees F., and in 1906-7, 49.10 degrees, while the total precipitation for the corresponding periods was 25.72 and 21.11 in., respectively. The average total vegetative season made up of the fall vegetative period, or the number of days from planting to January 1, and the spring vegetative period, or the number of days from March 1 to maturity, was 267 days in 1906, and 279 days in 1907. The average percentage of yellow berry was 33 in 1906, and 39 in 1907. To interpret the results with regard to the relation of temperature, light, air movements, and precipitation to the growth of the wheat plant, and the possible share of each factor in the production of yellow berry, was found to be extremely complex and intricate.

Among the many cultures of wheats examined, which were planted side by side at the same time, and which ripened on the same date, the percentages of yellow berry were found to vary widely. So-called commercial varieties, which were really mixtures of wheats, were grown under identically the same conditions in connection with this investigation. Among them strains of different type were found, which showed distinct physiological differences so far as the production of yellow berry was concerned. The varieties grown in 1906 were grouped into those wheats producing from 1 to 25 per cent., from 26 to 50 per cent., from 51 to 75 per cent., and from 76 to 100 per cent.



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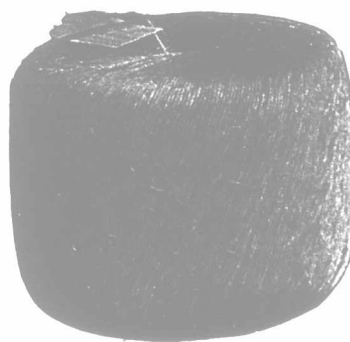
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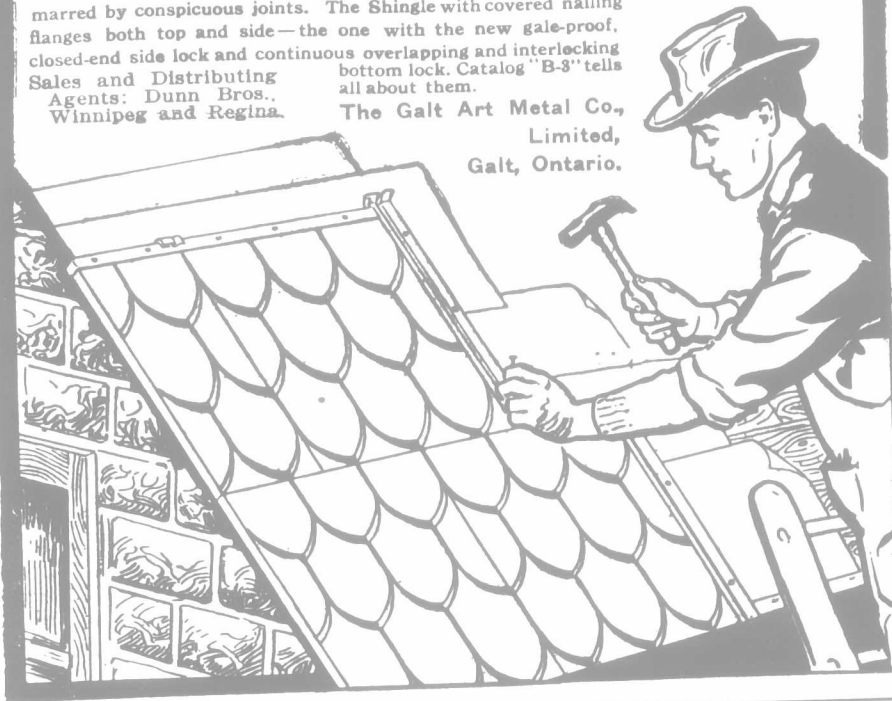
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of yellow berry. The crop of 1907 from these groups showed in general that the averages of the amount of yellow berry for each had the same relative position that they occupied in 1906. The minimum range of yellow berry in the varieties lay in those groups of 1907 that came from the minimum groups of 1906. Although the varieties low in yellow berry had progeny in 1907 which averaged 12.25 per cent. higher than the average of the corresponding parental groups for 1906, on the other hand the varieties high in yellow berry had progeny which averaged 27.41 per cent. lower than the average of the corresponding parental groups for 1906. It was further found that the progeny from selected hard kernels from eight apparently pure varieties planted in 1906 were much heavier than those from soft grains, and that as a rule the yields from the heavy, hard grains, were greater than those from the softer kernels.

The degree of inheritance of yellow berry in pure-bred or pedigree wheats is discussed, and the results secured in work along that line are reported. In the first progeny group of the pedigree wheats in 1907, a little over one-third produced no yellow berry at all, and the average of all was but 3.9 per cent., whereas in the selections of spikes from the common commercial varieties, as well as in the selections of hard and soft grains from these varieties, there were no cases whatever where the offspring were free from yellow berry. The averages for the lowest groups in the case of the common commercial varieties and of the selected hard and soft grains from the commercial varieties were 36.95 and 15.40 per cent., respectively.

It appears in general from the results that with the percentage increase of yellow berry in the parents, a mean percentage increase of yellow berry in the offspring was observed, and it is considered as very evident that the pedigree culture method, so far as the elimination of the yellow berry is concerned, is superior to the other methods tried. The common commercial variety lots of parents all contained yellow berry, but there were 61 cases (46 per cent.) in which the percentage ranged from 1 to 25. The progeny of these in 1907 showed a mean percentage of yellow berry of nearly 37, but among the pedigree cultures there were 38, or 36 per cent., which as parents fell into the 1 to 25 per cent. class, but which in 1907 showed a mean percentage of yellow berry of only 7.9. The minimum or zero class of parents gave rise also to the minimum class of the offspring in the case of the pedigree wheats.

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