

1894

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Recommended Citation

Curtiss, C. F. (1894) "Changes That Occur in Ripening Corn," *Proceedings of the Iowa Academy of Science*, 2(1), 56-57.

Available at: <https://scholarworks.uni.edu/pias/vol2/iss1/19>

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CHANGES THAT OCCUR IN RIPENING CORN.

BY C. F. CURTISS.

The great importance of corn as a forage and grain crop has induced the writer to record some observations in noting the successive changes that occur in the ripening process of this plant. These observations have been confirmed and emphasized by the generally unsatisfactory experience of the present season in the use of forage made from the immature corn plant.

It is well known that the corn plant in the process of ripening undergoes rapid and important changes. In order to note some of these changes equal areas, comprising one-fifth of an acre each, of uniform well-grown corn on the Iowa experiment station grounds, were cut and shocked in successive stages of growth at intervals of a week extending from September 17th to October 13th, 1892. This period took the corn in what is commonly termed the "dough stage" of the kernels, with stalks and leaves entirely green, and ended with the fully ripened ear, and stalks and leaves nearly all dead or dry, in the natural process of ripening without killing frost. These plots of corn were put into large, well-built shocks of 144 hills each on the dates named, and allowed to stand until the middle of December, the usual time of storing corn fodder under practical farm conditions. This was purposely included as one of the features of the investigation. To have been more scientifically accurate would have required immediate analyses at the time of cutting; however, all plots were treated alike, and the comparison undisturbed. The chemical work of this investigation was done by Prof. G. E. Patrick.

The yield of husked ear corn ranged from 53.6 to 64.3 bushels per acre. At the time of the first cutting the ear corn constituted 48 per cent by weight of the total crop; at the second, 49 per cent; at the third, 52 per cent; at the fourth, 53 per cent; and at the fifth, 54 per cent. There was then a steady increase of the proportion of corn to stover as ripening progressed. The

total dry matter in the crop increased from 3,489 pounds in the stover and 2,728 in the corn at date of first cutting to 3,856 in the stover in the second cutting and 3,194 in the corn in the third cutting. The total dry matter in the crop increased from 6,217 pounds in the first cutting to 6,782 pounds in the second, while the third and fourth fell short of this about 200 pounds, owing to a loss in stover not wholly compensated for in increase of corn, although the yield of corn and total dry matter contained to increase steadily until the fourth cutting, or for two weeks after the stover had reached its maturity. The marked increase in dry matter of both stover and corn between the first and second cutting indicates that the corn plant elaborates material rapidly at this stage, and the decrease of dry matter in stover and increase of that in corn afterward, furnishes evidence that there is considerable translocation of plant material after the stalk has attained its growth.

In noting the specific changes in composition it was found that the protein of the stover fell off rapidly after the second cutting, which continued steadily until the last and that there was an increase, although not a corresponding one, in the corn, until the third cutting, after which it also fell off. Carbohydrates and fat also fell off steadily in the stover after the second cutting and increased in the corn from the first to the fourth.

One sample of stover was left standing uncut in the field until December and then taken for analyses the same as the others. The total dry matter secured in this sample was 1,940 pounds against 3,856 from the plot of second cutting September 26th. A part of this, however, was due to mechanical loss, and the remainder to exposure to wind and weather.

At the Pennsylvania Station it has been found that both the total nutrients and the digestibility of a crop of corn increases as ripening progresses. Our observation seems in the main to agree with this, although there was a slight falling off of total dry matter in both corn and stover between the last two cuttings which would indicate that loss from exposure begins immediately or very soon after complete maturity has been attained. It is probable, also, that digestibility declines quite as soon if not before loss of nutrients sets in.