THE SPROUTING OF THE TWO SEEDS OF A COCKLEBUR.

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In 1901, Masterman reported some observations on the sprouting of cocklebur seeds, showing that both seeds of a bur usually sprout in the same year. This conclusion was at variance with Arthur's experiments; for Arthur had reported that the germination of both seeds of a bur of Xanthium in one season was exceptional. Crocker, in 1906, in his paper on the role of seed coats in delayed germination, reported tests on various cockleburs and stated that high temperature had a decided effect on the sprouting of the seed of the "upper" achene. This fact, no doubt explains most of the discrepancies of reported observations and experiments.

In 1909, the writer studied sprouting cockleburs on the sandy upper beech at Cedar Point, Ohio. A great majority of the burs buried in the sand were sprouting both embyros. In the summer of 1913, further observations were made. Because of the dry weather very few seeds of any kind were sprouting on the upper beech but on the bay side of the Point various low, moist, sandy areas contained abundant cocklebur seedlings. The plants all seemed to belong to the species, Xanthium pennsylvanicum Wallr. Most of the burs had two seedlings. Of those juvenile plants, one was usually larger than the other, as might be expected. Of course, it was not possible to determine whether these burs were one or two years old. But there is no question that in sandy soil with abundant heat and exposure to the sun, the two embryos sprout in the same season. And this is the practical side of the question for the farmer. In a cold climate under certain soil conditions only one embryo may sprout the first season and the other one the second, or even later.

In most cases the one seedling is considerably larger than the other as noted above. This would be expected if one begins to sprout earlier than the other. But there is frequently a difference in size and perfection of the two achenes in the bur. This difference is probably often simply caused by abortive development. The cocklebur has evolved from a small flower cluster, only two flowers remaining. There is little room in the bur and so in the struggle for space and food one achene often has the advantage and develops a better seed than the other. Probably in some species, the one seed is becoming vestigial while in others both achenes still have room to develop normally under ordinary conditions. It will be found on examination that even for normal burs, a certain percent have only one achene with an embryo capable of development.

In conclusion it might be stated that what is frequently taken for the seed-coat in the cocklebur is really the wall of the achene and quite different in structure from a true seed-coat. If past experiments have correlated this pericarp with true seed-coats it may be that further investigations might be of advantage.