Farm Talk

Jerry Webb

Ever since the phenomenal success of hybrid corn in boosting crop yields, plant breeders have been searching for ways to hybridize other crops. So far they haven't had a lot of luck.

The hybrid corn story has been told and retold as one of the great success stories of agricultural research. Those plant breeders of the 1930's, who turned that period's 25 and 30 bushel corn yields into today's national average of 106 bushels per acre, set the pace for others who followed.

The knowledge gained with hybrid corn isn't easily transferred to other crops, particularly soybeans.

It's been generally assumed that average soybean yields around 30 bushels per acre would increase dramatically if the hybrid process could be introduced. And that our national average would skyrocket the way of hybrid corn, if the plant breeders could just get it all together.

But it's not that easy, according to Randy Nelson, a University of Illinois agronomist, who recently completed a research project on hybrid soybeans.

He says it's not just a matter of producing a hybrid bean, but producing one that is better then pure lines.

He also points out that the hybrid corn success story didn't happen overnight. It was the result of 30 or 40 years of research, and Nelson says maybe great soybean yields through hybridization will be possible in the future But right now, the practical restraints are overwhelming.

A hybrid is an offspring of genetically unlike parents Hybrids are produced by inter-planting selected male sterile and male fertile plants.

Cross pollination of male sterile plants by pollen from male fertile plants leads to hybrid seed formation.

Two major obstacles prevent the commercial use of hybrid soybeans.

First, soybeans are self pollinated. That means that both the male and female parts are present on the same flower. Pollen that is produced by such a flower also pollinates that flower, so the first step is producing a hybrid is to prevent self pollination.

Then there's the problem of moving pollen from the pollen parent to the seed parent. The Illinois and researcher says chemical, genetic, or cytoplasmic methods of preventing self-pollination in the seed parents is needed before hybrid soybean seed can be produced on a commercial scale.

In 1971, the first male sterile gene was found in soybeans and since then several more have been found. These genes prevent viable pollen from being formed.

As a research tool, that enables scientists to get some plants that are male sterile. But with this method, at best only half will be male sterile and half fertile. So this requires pulling out at least half the plants, the ones that are fertile

To do this, a researcher has to look at the individual flowers of each soybean plant to see if they're shedding pollen. It's very time-consuming and therefore not practical on a commercial basis.

Another method, cytoplasmic sterility, which exists in corn, may be discovered in soybeans, but that hasn't happened yet.

Even if a mechanism is discovered for obtaining male sterile soybean plants, there's till the problem of getting the pollen from one plant to another.

Unlike corn pollen, soybean pollen is not carried by the wind so another means of transportation must be found. One hope for this that is being explored involves transferring pollen by insects, such as honey bees.

The Illinois researcher has produced data on 37 hybrid combination–the best single year increase was less than 30 percent, and Nelson says the samples were too small to produce conclusive results.

In producing soybean hybrids, the plant expert points out that breeders are striving for increased yields. Traits like disease resistance are often controlled by a single gene and are relatively easy to transfer in plant breeding.

Yield is a very complex trait and is more likely to be improved in a hybrid.

Potentially, he says, every gene in the plant has an effect on yield.

The way the seed is produced is dependent on the overall efficient functioning of the plant from the extracting of carbon dioxide from the air to water and nutrition from the soil, to the final conversion into complex carbohydrate oil and protein in the sea.

Nelson says parents should be selected for their ability to produce good hybrids and not for their ability to yield as a pure line.

In other crop areas, researchers are working with hybridization and some are being grown commercially. But Nelson thinks researchers are still down the road quite a ways from a commercial hybrid soybean.