Plant modification may hold key to increasing food production

COLLEGE PARK, Md. — It's like trying to find a genetic needle in a haystack, but it could hold one of the keys to feeding a growing world population showing no signs of losing its appetite.

Isolating and genetically inducing beneficial plant mutations could give us disease-resistant food crops in the future or even produce the world's first tomato capable of growing in soil now considered unfit to support life, according to a botany researcher for the Maryland Agricultural Experiment Station.

But reaching down, in a manner of speaking, into the genetic coding of agricultural food crops and producing selectively just the right mutation to accomplish this has been a hit-or-miss proposition in the past, says MAES genetic researcher Paul Bottino.

Bottino says his studies at the University of Maryland, College Park, may enhance the odds enough so that someday researchers possibly could produce specific beneficial mutations at will to surmount any number of obstacles Mother Nature has placed before agriculture's efforts to increase food production.

"Nature may produce a better corn or soybean plant through its own mutation process, but the odds of that are at best maybe one-in-a-million," Bottino says.

"If, on the other hand, we are able to induce artificially a mutation at the cellular level for, say, a tomato plant capable of growing in salt-laden soil, then we've come a long way in changing those odds in our favor."

Specifically, Bottino's work involves a sleuth's campaign to find individual mutagens — or mutation-causing agents — that will produce mutations in high frequencies.. The work is geared toward genetically engineering mutations to make plants more tolerant to environmental stress such as disease and toxic substances in the soil and environment.

Increased disease resistance and the ability to raise food crops on land considered marginal for crop production may take researchers a long way toward moving agricultural food production a quantum leap beyond its present pace.

Bottino says his current work differs from previous efforts to produce beneficial mutations in that this study moves from the chancy whole-plant level down to the cellular level.

Once a proper mutagen is found to produce mutations, the single cell or group of cells is nourished in an artificial selective environment where only the mutations can reproduce, giving their offspring genetic coding identical to the parent cells.

This form of genetic manipulation, says Bottino, can carry the mutation all the way back to the plant level where the newly-created mutant plant can, in turn, pass its mutation genetically through its offspring.

"Horticulturists, as well as geneticists like me, are interested in this technique because of all the potential benefits," says Bottino. "And although it falls short of replacing classical plant breeding methods, genetic manipulation in cell culture can develop new plant types in one chemical step that breeders could use in developing new varieties through traditional breeding methods."

Sunflower meal offers protein substitute in poultry rations

WASHINGTON, D.C. — Dehulled and defatted high fiber sunflower seed meal (SSM) offers an effective protein substitute for soybean meal, fish meal, meat and bone meal, and other high protein materials, according to James L. McNaughton, Agricultural Research Service. research nutritionist for the South Central Poultry Research Laboratory.

• "SSM's useage is especially important when low-protein complete diets are desirable for mature poultry—for instance, commercial layers, turkey and broiler breeders, and commercial egg-type pullets," says McNaughton.

McNaughton reports that using dehulled, defatted sunflower meal containing 36 to 38 percent protein will satisfy the protein requirements of commercial layers and broiler hens. He sees SSM as more valuable in layer diets than in broiler diets and its use is accompanied by a reduction in levels of soybean meal and methionine (an amino acid) and increases in the level of fat.

To determine the effectiveness of high-fiber SSM as a replacement for soybean meal, two experiments were conducted using commercial laying hens to evaluate replacing 33, 66, and 100 percent protein from soybean meal with high-fiber SSM (36.1 percent protein).

Neither body weight change, egg production, egg weight, nor eggshell breaking strength was affected by the addition of SSM, McNaughton reports.

Data from the two experiments indicate that SSM may replace 100 percent soybean meal without adversely affecting laying-hen performance.

In practical broiler diets, the maximum amount of SSM tolerated by broiler chicks without adversely affecting broiler performances, appears to be 15 percent in all mash diets and 30 percent in pelleted feeds.

Laying hens may tolerate as much as 100 percent replacements of supplemental protein, such as soybean meal, by sunflower meal. Although feed consumption tends to increase when using high-fiber SSM, this factor must be considered when evaluating economical alternatives.

McNaughton cautions that when formulating broiler, broiler-breeder, laying-hen and turkey diets, it is important to remember that SSM is relatively low (1.02 to 1.78 percent) in lysine, protein's most important amino acid in the poultry diet. Therefore, improving low-lysine sunflower meal with synthetic lysine is one possible economical consideration.