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One Hundred Years of Bean Breeding at Michigan State University: A Chronology

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As a farewell to the 20th Century, I thought it would be interesting to summarize the milestones achieved in bean breeding over the last century.



All breeding research at Michigan State University (MSU) is conducted through the Michigan Agricultural Experiment Station (MAES) housed originally in Michigan State College and now in MSU. The achievements in bean breeding are based on the efforts of dedicated scientists, staff and students, and credit must be given to them.

Forty varieties in eight commercial classes were developed and released during the 20th Century and each has contributed in different ways to the success and stability of the dry bean industry in the state and elsewhere. A more detailed summary of bean breeding activities was described previously by Dr. Axel Andersen in the Michigan Dry Bean Digest, 1982/83.

Improved Bean Breeding

Dr. Spragg was the first plant breeder hired by the MAES and his greatest contribution to plant breeding was the release in 1915 of the first navy bean variety, Robust. Robust was selected as a consistent performer among lines of native landrace strains of navy bean grown in Michigan. Robust was identified as a consistent high-yielder. Other varieties developed during this era were Wells red kidney and Rainy River navy, but all navy beans suffered from being full-season, decumbent plant type, highly susceptible to white mold, mosaic virus and anthracnose. Improved navy bean breeding was achieved through cross breeding rather than pure line selection. After Spragg died, Dr. E.E. Down undertook the breeding effort which resulted in the release of Michelite navy bean in 1938. Michelite was derived from the cross of Early Prolific with Robust and it proved to be higher yielding with better seed quality than Robust. In addition, Michelite was resistant to common strains of bean common mosaic virus (BCMV) present in Michigan during that era.

Bush Variety Created with X-ray Mutation

Following the release and widespread acceptance of Michelite, attempts were made to introduce a determinate bush habit into the navy bean through traditional backcross breeding were unsuccessful, so a program of using X-ray mutation breeding was undertaken in the 1940s. This resulted in the development of the first bush navy bean variety, Sanilac, in 1956. Sanilac was one of the first successful crop varieties to be developed through mutation breeding. The work was the culmination of the efforts of Down and Dr. Axel Andersen, USDA-ARS plant pathologist affiliated with the breeding program. Sanilac was significant for its upright bush habit, earlier maturity, anthracnose and white mold resistance.

Sanilac heralded the era of the development of early season bush navy bean varieties in the 1960s and those efforts were directed by Dr. Wayne Adams. His work resulted in the release of three early-season bush navy bean varieties, Seaway, Gratiot, and Seafarer, all destined for markets in Europe through the newly opened St. Lawrence Seaway. Since the seaway froze early in the winter, early season varieties were essential to sustain the vital export market. Traditional full-season varieties would not have met the needs of this market due to the three week delay in harvesting. The Seafarer variety retained its popularity among growers for two decades after its release in 1968.



In conjunction with Dr. Fred Saettler, the next USDA-ARS plant pathologist to be affiliated with the breeding program, Adams turned his attention to kidney beans. Problems with halo blight were jeopardizing this sector of the industry. Adams and Saettler released the Montcalm dark red kidney variety in 1974 which assured the continued successful production and expansion of kidney bean production in Michigan, particularly Northern Michigan where crop alternatives were scarce. A quarter century after its release, Montcalm is still the most widely grown dark red kidney bean variety, sought by growers for its halo blight resistance and processors for its superior canning quality.

Upright Beans

During the 1960-70s when spectacular yields in wheat and rice were touted internationally as the 'Green Revolution', Adams turned his attention to plant modification in beans as an approach to improving yield. He proposed a more upright plant habit, referred to as a 'archetype', and he designed a new bean plant based on his observations and experience with bean germplasm from Central America. The approach, known as ideotype breeding, has resulted in development of new upright varieties starting with Swan Valley in 1982, followed by Neptune, C-20, Mayflower and the most recent variety, Mackinac, released in 1996. These varieties and the commercial varieties developed directly from them formed the basis of the significant increase in yield in beans during the current decade.

Diversifying Bean Varieties

As a direct spinoff from the program to develop upright navy beans, new black bean varieties were developed from the Central American black bean germplasm used as parents in the breeding program. Varieties like Domino and Black Magic sparked a renewed interest in black beans and contributed to the increasingly available markets in Mexico and other Latin

Bean varieties released by MAES-MSU
(PDF)

beans

1920's Active program in navy bean strain testing and breeding at MSU.

1930's Release of Michelite navy bean variety in 1938. Michelite was the first bred variety released by MSU.

1940's Attempts to use X-rays to generate novel genetic variability useful in bean breeding.

1950's Release of Sanilac navy bean in 1956. Sanilac was the first bush navy bean released by MSU.

1960's Release of series of early season bush navy bean varieties, Seaway, Gratiot, and Seafarer, destined for European markets via the St. Lawrence Seaway.

1970's Release of Montcalm dark red kidney bean in 1974. Montcalm was the first halo blight resistant kidney bean which revitalized that industry in Northern Michigan.

1980's Class diversification in black and pinto beans. Release of first black, pinto, great northern bean varieties, Domino, Black Magic, Sierra and Alpine by MSU.

1990's Broad adoption of the full-season, high-yielding, upright short vine navy and black bean varieties by growers.

¹Raven, W.F. 1910. Bean production. Mich. State Agric. College Expt. Stat. Bulletin 259.

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