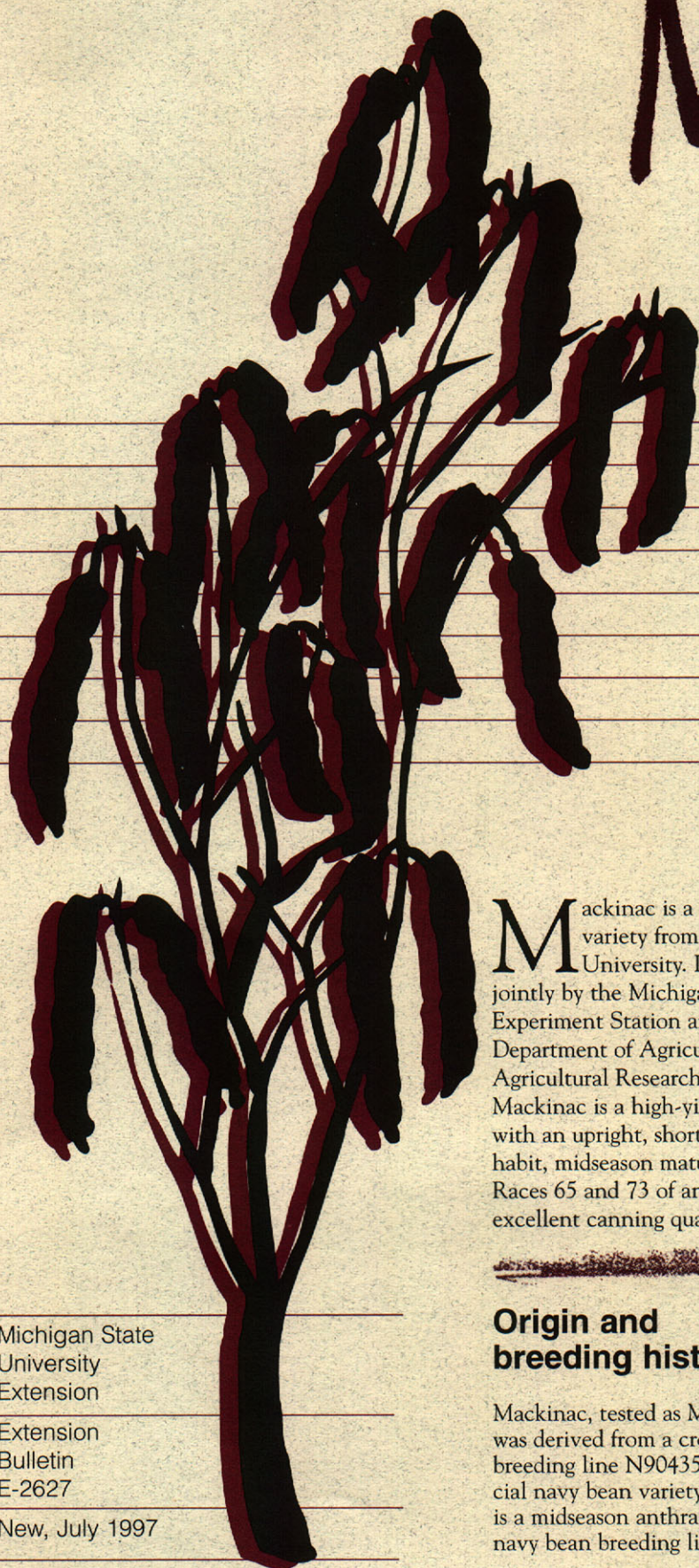


**NEW from  
MSU**

# Mackinac

A NEW NAVY BEAN

*for Michigan*



- Upright, short vine growth habit similar to that of Mayflower.
- Taller and more lodging resistant than Avanti.
- Five days earlier in maturity than Mayflower and Vista.
- Outyielded Avanti by 6 percent over 20 locations in four years.
- Equivalent in yield to Mayflower and Schooner.
- Resistant to mosaic virus, rust and Races 65 and 73 of anthracnose.
- Equivalent to Avanti in tolerance to white mold.
- Excellent canning quality similar to that of Avanti.

**M**ackinac is a new navy bean variety from Michigan State University. It was released jointly by the Michigan Agricultural Experiment Station and the U.S. Department of Agriculture's Agricultural Research Service. Mackinac is a high-yielding variety with an upright, short vine growth habit, midseason maturity, resistance to Races 65 and 73 of anthracnose, and excellent canning quality.

## Origin and breeding history

Mackinac, tested as MSU No. N93296, was derived from a cross between MSU breeding line N90435 and the commercial navy bean variety Avanti. N90435 is a midseason anthracnose-resistant navy bean breeding line; Avanti is an

indeterminate short vine variety with midseason maturity and excellent seed and canning quality, but it lacks rust and anthracnose resistance. The cross was designed to incorporate anthracnose resistance into the popular Avanti navy bean variety. The cross was made in 1991 and advanced to the F<sub>6</sub> generation before entry in yield trials. An anthracnose-resistant breeding line was entered into yield trials in 1993 with the code number N93296.

## Yield performance

Mackinac was tested extensively for yield and agronomic traits for four seasons (1993-96) over 27 locations (Table 1). It averaged 23 cwt/acre and, except for the full-season variety Vista, outyielded all commercial navy bean varieties by a margin of 1 to 16 percent. In the absence of disease such as blight and white mold, Mackinac has pro-

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duced yields in excess of 35 cwt/acre and has outyielded the Avanti parent by 6 percent (1.4 cwt/acre) over 20 locations. Mackinac has been competitive with the full-season high-yielding varieties Mayflower and Schooner but yielded 5 percent less than Vista in 19 locations.

## Agronomic features

Mackinac exhibits an erect, short vine growth habit, averaging 23 inches in height with the pods positioned high in the plant canopy. It has excellent resistance to lodging compared with Avanti, with a score of 2 versus 3 on a 1 to 5 scale where 1 is the most erect.

Mackinac is a midseason variety, maturing 95 days after planting with a range in maturity from 87 to 98 days, depending on

season and location. It matures five days earlier than the full-season varieties Mayflower and Vista, and two days later than Avanti. It matures three days earlier than Schooner and four days later than Huron. Mackinac has demonstrated uniform maturity and excellent dry-down across a broad range of environments and fits a niche for an erect, high-yielding, midseason navy bean variety in Michigan.

## Disease resistance

Mackinac carries the single dominant hypersensitive I gene resistance to bean common mosaic virus (BCMV) but is sensitive to the temperature-insensitive necrosis-inducing strains of BCMV, which cause the black root reaction. Mackinac carries the Co-1 gene for resistance to Races 65 and 73 of anthracnose, which are

present in Michigan. It carries the Ur-3 rust resistance gene, which conditions resistance to all local rust races prevalent in Michigan. Mackinac has shown tolerance to white mold equivalent to Avanti's but less tolerance than Bunsu, so chemical control is recommended when weather or growing conditions favor disease development.

## Quality characteristics

Mackinac has a round navy bean seed averaging 21 g per 100 seeds and ranging from 19 to 23 g per 100 seeds. The dry seed is equivalent in size, shape and color to Avanti. Mackinac was rated for cooking quality and scored 3.5 on a 5-point hedonic scale (where 5 is best). This evaluation showed Mackinac equivalent to Avanti (4.0 score) in whole bean integrity (no splitting or clumping), uniformity of size (uniform water uptake), color (no after-darkening) and clear brine (no starch extruded into canning liquid). After it is processed, Mackinac does not differ significantly from other commercial navy bean cultivars for cooked color, texture, hydration and drained weight ratios.

## Release and research assessment

Mackinac is released as a public, non-exclusive variety jointly by the Michigan Agricultural Experiment Station and the Agricultural Research Service. A research fee will be assessed on each unit (hundred-weight) of certified seed sold.

Table 1. Mackinac navy bean — comparison of agronomic, disease, performance and canning characteristics.

Traits	Mackinac	Avanti	Mayflower	Huron	Vista	Schooner
<b>Agronomic traits</b>						
Days to flower	45	44	47	40	49	45
Days to mature	95	93	100	91	100	98
Height (cm)	55	48	50	46	55	45
Lodging score (1-5)	2.0	3.0	2.0	3.0	2.5	3.5
Selection index (1-9)	6.0	5.5	5.0	5.5	6.0	5.0
Seed size (g/100 seeds)	21	20	19	25	21	20
Yield (percent)	100	94	97	91	105	99
<b>Disease resistance</b>						
BCMV	R	R	R	R	R	R
Anthracnose race 65	R	S	S	R	R	I
Anthracnose race 73	R	S	S	S	S	I
Rust race 53	R	S	R	R	R	R
Common blight	S	S	S	S	S	S
White mold	3	3	3	2	3	4
<b>Canning quality</b>						
Color L-scale	50	51	51	50	50	51
Texture (kg/100 g)	75	66	80	59	45	56
Washed drained ratio	1.3	1.3	1.3	1.2	1.3	1.3
Hydration ratio	1.8	1.9	1.9	1.9	1.9	1.9
Organoleptic rating (1-5)	3.5	4.0	2.8	4.3	2.5	3.0

Lodging: 1 = erect, 5 = prostrate

Selection index: 1 = worst, 5 = average, 9 = best, based on adaptation

Diseases: R = resistant, I = intermediate, S = susceptible

White mold: 1 = resistant, 3 = intermediate, 5 = susceptible

Organoleptic rating: 1 = worst, 5 = best on general cooked appearance

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