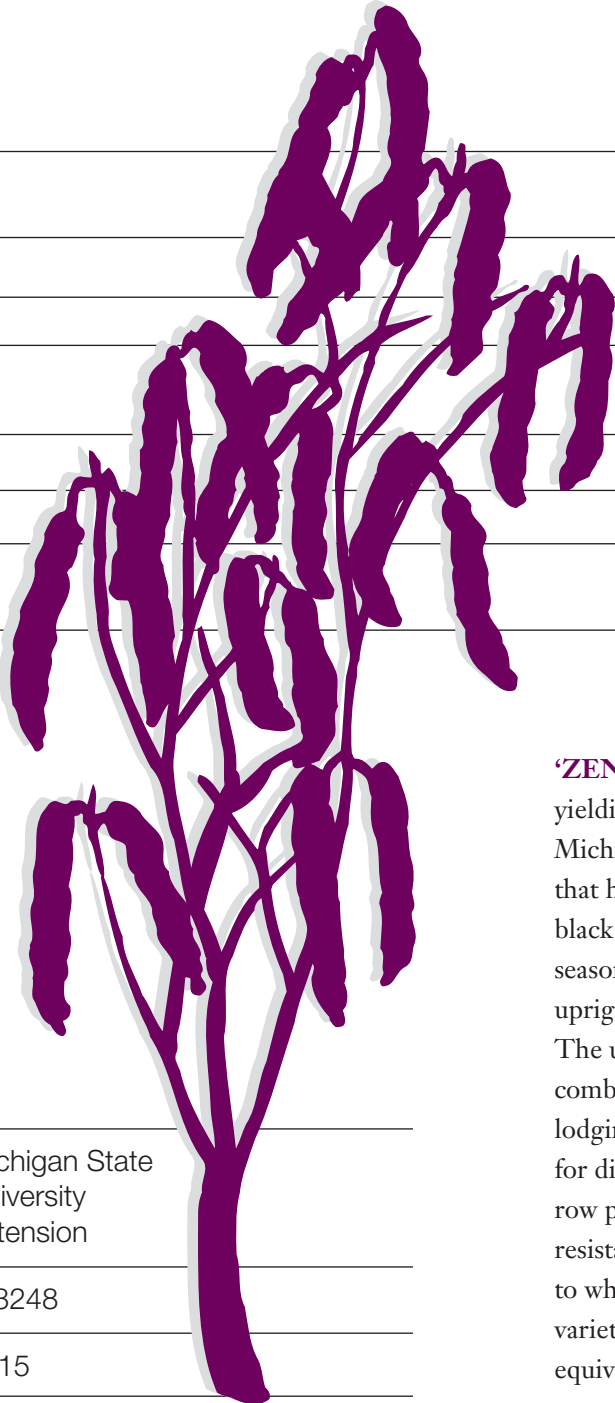


NEW from MSU

'Zenith'

A New
Black Bean Variety

for Michigan



- New upright full-season black bean variety suited for direct harvest.
- Highest yielding black bean variety in five years of testing.
- Matures in 100 days, similar to 'Zorro'.
- Exhibits uniform maturity coupled with good dry down similar to 'Zorro'.
- White mold avoidance due to upright plant habit.
- Resistant to race 73 of anthracnose.
- Attractive black bean seed that possesses unique canning quality.

'ZENITH' is a new erect, high-yielding black bean variety from Michigan State University (MSU) that has out-yielded all current black bean varieties. This full-season maturing variety has an upright, short vine growth habit. The upright narrow plant profile, combined with resistance to lodging, makes 'Zenith' suitable for direct harvest under narrow row production systems. 'Zenith' is resistant to race 73 of anthracnose to which most current black bean varieties are susceptible. 'Zenith' is equivalent to 'Zorro' in tolerance

to white mold and is resistant to strains of bean rust and bean common mosaic virus (BCMV) present in Michigan. The seed of this variety is similar in size to that of 'Zorro', yet it possesses unique canning properties. Following canning, 'Zenith' retains the black color better than current black bean varieties such as 'Eclipse' that tend to bleed and produce a less desirable chocolate-brown canned product.

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Origin and Breeding History

'Zenith', tested as MSU black bean breeding line B10244, was developed from the cross of black bean breeding line B04644 and the black bean variety 'Zorro' from the MSU breeding program. B04644 is an upright black bean derived from the three-way cross of B98306/'Jaguar'/NG8025. B04644 carried the anthracnose resistance gene Co-1 from the 'Jaguar' parent. In testing, it exhibited superior canning quality as it retains black color following canning, a characteristic coming from the black bean parent NG8025 from Mexico. 'Zorro' is a high-yielding upright black bean variety well adapted to Michigan that lacks resistance to anthracnose. The cross was made to transfer anthracnose resistance and superior canning quality into new high-yielding upright black bean varieties.

Agronomic and Disease Information

'Zenith' exhibits the upright type-II indeterminate short vine growth habit combined with good resistance to lodging (1.4 on a 1–5 scale). Plants average 21 inches in height, similar to the heights of 'Zorro' and 'Shania'. 'Zenith' is a full-season bean maturing 100 days after planting. The range in maturity is from 89 to 105 days, depending on season and location. It matures with 'Zorro' and 'Loreto', one day earlier than 'Shania' and four days later than 'Eclipse'. 'Zenith' has demonstrated the same uniform maturity and dry down as 'Zorro', and is more erect than 'Shania'. 'Zenith' has a high agronomic acceptance rating based on its upright habit, resistance

to lodging, excellent pod load and favorable high pod placement in the plant canopy.

'Zenith' has been tested for five years (2010–2014) in 45 locations by MSU researchers in cooperation with colleagues in Michigan, New York and Ontario. The combined yield data comparisons with other black cultivars are shown in Table 1. Over 45 locations, 'Zenith' yielded 28.4 hundredweight per acre (cwt/acre) and significantly out-yielded 'Zorro' by 6%, 'Shania' by 5%, 'Eclipse' by 12%, 'Loreto' by 9% and 'T-39' by 13%. Yield ranged from a high of 41.2 cwt/acre in Blyth, Ontario, in 2012, to a low of 13.4 cwt/acre under severe white mold conditions in Huron County, Michigan, in 2014.

Planted in narrow rows (20 inches) and combined with direct harvest, 'Zenith' has produced competitive yields in excess of 30 cwt/acre in Michigan and appears well adapted to a range of production systems in New York and Ontario (41 cwt/acre), where black beans are grown commercially. 'Zenith' appears to be well adapted to this increasingly popular management system. Growers should follow current recommended practices for fertility and weed control in growing 'Zenith' beans. Recommendations can be found online from the Saginaw Valley Research and Extension Center (agbioresearch.msu.edu/saginawvalley) and MSU Weed Science (msuweeds.com).

'Zenith' possesses the single dominant hypersensitive I gene, which confers resistance to seed-borne BCMV. All the black varieties listed in Table 1 possess the same resistance gene. 'Zenith' possesses the Co-1 gene that provides resistance to anthracnose race 73 to

which all other black bean varieties except 'Loreto' are susceptible. 'Zenith' exhibits similar tolerance to white mold compared to other black bean varieties. Percent white mold was 36% compared to 'Zorro' (35%) and 'Shania' (63%), 'Eclipse' (52%) and 'T-39' (70%) when grown in irrigated trials over 4 years. 'Zenith' exhibits a range of reactions to other pathogens similar to commercial black bean varieties. It is susceptible to common bacterial blight; it possesses resistance to some races of rust but is susceptible to rust race 22:2 now prevalent in Michigan.

Quality Characteristics

'Zenith' has a typical small-sized black bean seed, averaging 22 g/100 seeds and a size range from 20 to 25 g/100 seeds. The seed is similar in size and appearance to 'Loreto' and 'T-39' (22g), is slightly larger than 'Zorro', 'Shania' and 'Eclipse' (20g), and resembles the round plump appearance of 'T-39'.

In canning trials, 'Zenith' has been subjectively rated by a team of trained panelists as being excellent in cooking quality. This evaluation is based on whole bean integrity (no splitting or clumping), uniformity of size (uniform water uptake), cooked seed color (limited color leaching) and clear brine (no starch extrusion into canning liquid). 'Zenith' rated 4.5 on a scale of 1 to 5 where 5 is best and 3 is mid-scale (neither acceptable nor unacceptable). Within the commercial black bean class, 'Zenith' was rated highest in visual color (4.6) when compared to 'Zorro' (3.5), 'Eclipse' (2.3) and 'T-39' (3.3). Data on L-color (lightness scale) of cooked beans showed that 'Zenith' was blacker (13.1)

Table 1. Comparison of yield, agronomic, disease and canning characteristics of ‘Zenith’ with five other black bean varieties over 5 years testing (2010-2014) in Michigan, New York and Ontario

Traits	Varieties					
	‘Zenith’	‘Zorro’	‘Shania’	‘Eclipse’	‘Loreto’	‘T-39’
Agronomic traits						
Days to flower	45	46	46	43	44	45
Days to maturity	100	100	101	96	100	100
Height in inches	21	21	21	20	21	18
Lodging score ^a Average (1–5)	1.4	1.7	1.8	1.3	2.3	3.1
Agronomic index ^b Average (1–7)	5.5	5.1	3.8	4.2	3.8	3.4
100-seed weight in grams	21.7	20.2	20.3	20.1	22.1	21.5
Mean yield ^c (cwt/acre)	28.4	26.7	26.6	25.2	25.6	24.5
Yield percentage	100	94	95	88	91	87
Disease resistance traits^d						
BCMV ^e	R	R	R	R	R	R
Anthracnose: race 73	R	S	S	S	R	S
Rust race 22:2	S	S	S	S	S	S
Common bacterial blight	S	S	S	S	S	S
White mold percentage ^f	36	35	63	52	—	70
Canning quality traits						
Color L-scale ^g	13.1	15.8	16.9	18.1	16.2	16.2
Visual color ^h	4.6	3.5	3.1	2.3	3.1	3.3
Texture ⁱ (kg/100g)	41	43	39	47	37	38
Visual rating ^j	4.5	4.0	3.2	3.6	3.4	3.5

^a Lodging: 1 = Erect, 5 = Prostrate

^b Agronomic index: 1 = Worst, 7 = Excellent

^c Yield was averaged over 45 locations from 2010 to 2014

^d Diseases: R = Resistant, S = Susceptible

^e BCMV = Bean Common Mosaic Virus

^f White mold: Percentage of disease incidence and severity

^g Color L-scale: Lightness scale, lower number the blacker the product

^h Visual color: 1= Undesirable brown color, 5 = Desirable black color

ⁱ Texture: Kg of force needed to compress 100 g canned beans

^j Visual rating: 1 = Very undesirable, 3 = Neither desirable nor undesirable, 5 = Very desirable

than all other black beans as the lower value indicates darker color and better color retention following canning. No major differences were observed for texture ranging from 38 to 43 kg/100g and ‘Zenith’ (41 kg) was within the acceptable range of 30 to 60 kg/100g for processed black beans. ‘Zenith’ possesses superior canning quality for black beans sought by the canning industry.

Release and Research Fee

‘Zenith’ was released by Michigan State University with the option that ‘Zenith’ be sold for seed by variety name only as a class of certified seed under the three-class system used in Michigan (breeder, foundation,

certified). A royalty will be assessed on each hundredweight unit of either foundation seed or certified seed sold, depending on the production location (east or west of the continental divide). Plant Variety Protection (PVP) from the USDA Agricultural Marketing Service is anticipated. Parties interested in licensing ‘Zenith’ may contact MSU Technologies (technologies.msu.edu) by phone at 517 355-2186 or by e-mail at msut@msu.edu.

Acknowledgments

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