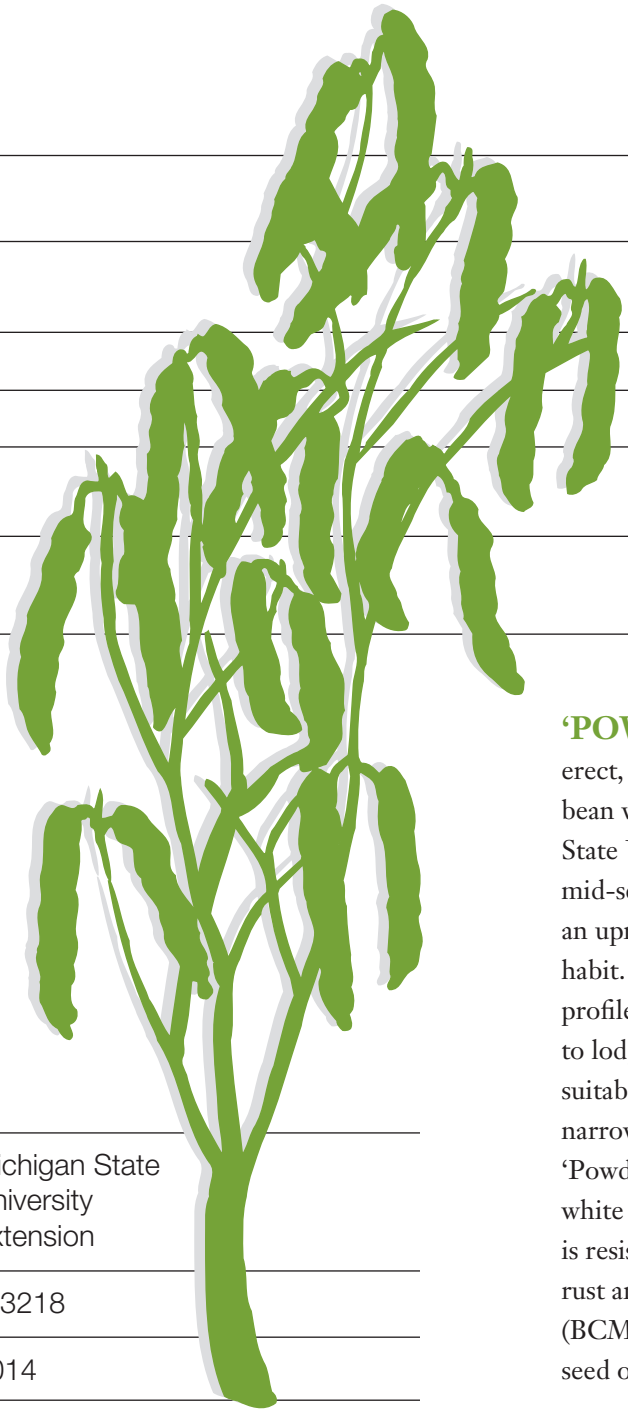
NEW from MSU

'Powderhorn'

A New Great Northern Bean Variety for Michigan



- New upright great northern bean variety suited for direct harvest.
- Matures in 95 days, one day later than the 'Matterhorn' great northern bean.
- Exhibits uniform maturity and good dry down.
- White mold avoidance due to upright plant types.
- Resistant to common strains of rust and mosaic virus in Michigan.
- Attractive great northern bean seed that possesses acceptable canning quality.

Michigan State University Extension

E-3218

2014

'POWDERHORN' is a new erect, high-yielding great northern bean variety from Michigan State University (MSU). This mid-season maturing variety has an upright, short vine growth habit. The upright narrow plant profile, combined with resistance to lodging, makes 'Powderhorn' suitable for direct harvest under narrow row production systems. 'Powderhorn' is more tolerant of white mold than 'Matterhorn' and is resistant to the strains of bean rust and bean common mosaic virus (BCMV) present in Michigan. The seed of this variety is slightly larger than the seed of 'Matterhorn' and it has improved seed quality and very acceptable canning quality.

Origin and Breeding History

'Powderhorn', tested as MSU bean breeding line G08254, was developed from the cross made in 2005 of two MSU great northern bean breeding lines/varieties: G04514/'Matterhorn'. MSU breeding line G04514 is an upright great northern that was derived from an earlier three-way cross of G99750/'Matterhorn'/N00904 made to introduce the

white mold tolerance of navy line N00904 into the great northern seed type. 'Matterhorn' is a high-yielding, mid-season, upright great northern variety that is susceptible to white mold and has exhibited seed quality problems when grown under drought stress. The variety has also lost favor because it has a thin seed coat that is prone to seed coat checking during harvest, and handling under cold winter conditions. The purpose of the two-way cross was to enhance the seed coat quality and improve the level of resistance to white mold in the resulting new great northern varieties. The cross made in 2005 was advanced to the F_6 generation and entered into yield trials in 2008 under the code number G08254.

Agronomic and Disease Information

'Powderhorn' exhibits the upright type-II indeterminate short vine growth habit combined with good resistance to lodging (1.7 on a 1–5 scale). Plants average 20 inches in height and are 1 inch taller than 'Matterhorn'. 'Powderhorn' is a mid-season bean maturing 95 days after planting. The range in maturity is from 81 to 103 days, depending on season and location. It matures one day later than 'Matterhorn' and is two days earlier than the variety 'Coyne'. 'Powderhorn' has demonstrated the same uniform maturity and dry down as 'Matterhorn', and is more erect than 'Coyne'. 'Powderhorn' 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.

'Powderhorn' has been tested for six years (2008–2013) in 36 locations by MSU researchers in cooperation with colleagues in Michigan, Colorado, Nebraska and North Dakota. The combined yield data comparisons with other great northern varieties are shown in Table 1. Over 36 locations, 'Powderhorn' yielded 26.1 hundredweight per acre (cwt/acre). It significantly out-yielded 'Matterhorn' (by 8% over 29 locations) and 'Coyne' (by 9% over 17 locations). Yield ranged from a high of 39 cwt/acre in Hatton, North Dakota, in 2012 to a low of 9.2 cwt/acre under drought conditions in the same location in 2010.

Planted in narrow rows (20 inches) and direct harvested, 'Powderhorn' has produced competitive yields in excess of 33 cwt/acre in Michigan and appears well adapted to a range of production systems in Colorado (35 cwt/acre), North Dakota (39 cwt/acre) and Nebraska (38 cwt/acre) where great northern beans are grown commercially. 'Powderhorn' appears to be well adapted to this increasingly popular narrow-row management system. Growers should follow current recommended practices for fertility and weed control in growing 'Powderhorn' beans. Recommendations can be found online from the Saginaw Valley Research and Extension Center (*agbioresearch.msu.edu/saginawvalley*) and MSU Weed Science (*www.msuweeds.com*).

'Powderhorn' possesses the single dominant hypersensitive *I* gene, which confers resistance to seed-borne BCMV. All three great northern varieties listed in Table 1 possess the same resistance gene. 'Powderhorn' exhibits greater tolerance to white mold than other great northern bean varieties. Percent white mold was 50% compared to 'Matterhorn' (70%) and 'Beryl' great northern (90%) when grown in irrigated trials over 4 years. 'Powderhorn' exhibits a range of reactions to other pathogens similar to that of other commercial great northern bean varieties. It is susceptible to race 73 of anthracnose and to common bacterial blight. It also possesses resistance to some races of rust but is susceptible to rust race 22:2 that is now prevalent in Michigan.

Quality Characteristics

'Powderhorn' has a typical medium-sized great northern bean seed, averaging 37 g/100 seeds and a size range from 33 to 41 g/100 seeds. The seed is slightly larger than 'Matterhorn' (36 g) and slightly smaller than 'Coyne' (39 g). Dry seed of 'Powderhorn' was rated for defects on a scale of 1 to 4, with 1 = no seeds showing defects and 4 = >50% seed showing defects. 'Powderhorn' rated 2.0, compared to 'Matterhorn' at 2.5, on seed grown in 2011.

In canning trials, 'Powderhorn' has been subjectively rated by a team of trained panelists as being average 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). 'Powderhorn' rated 3.6 on a scale of 1 to 7 where 7 is best and 4 is mid-scale (neither acceptable nor unacceptable). Within the commercial great northern bean class,

'Powderhorn' was rated slightly lower than 'Matterhorn' (4.2) but superior to 'Coyne' (2.8) in visual appearance. Data on L-color (lightness scale) of cooked beans showed that 'Powderhorn' was similar in color to both 'Matterhorn' and 'Coyne'.

No differences were observed in hydration ratios between 'Powderhorn' and 'Matterhorn', whereas 'Coyne' hydrated slower due to its shiny seed coat. Drained weight ratios were similar for both 'Powderhorn' and 'Matterhorn' and higher for 'Coyne' (as a result of the lower initial water uptake of 'Coyne'). The texture of 31 kg/100g was slightly higher than 'Matterhorn' (28 kg) and 'Coyne' (26 kg), whereas the value for 'Powderhorn' was within the acceptable range of 30 to 60 kg/100g for processed great northern beans.

TABLE 1. Comparison of agronomic, disease and canning quality characteristics of 'Powderhorn', 'Matterhorn' and 'Coyne' great northern bean varieties

Traits	Varieties		
	'Powderhorn'	'Matterhorn'	'Coyne'
Agronomic traits			
Days to flower	42	42	42
Days to maturity	95	94	97
Height in inches	20	19	19
Lodging[a] score average (1–5)	1.7	1.9	2.1
Agronomic index[b] average (1–7)	4.6	4.4	4.0
100 seed weight in grams	36.8	35.5	38.9
Mean yield[c] (cwt/acre)	26.1	24.1	23.8
Yield percentage	100	92	91
Disease resistance traits[d]			
BCMV	R	R	R
Genes controlling BCMV	I	I	I
Anthracnose: race 73	S	S	S
Rust race 22:2	S	S	S
Common bacterial blight	S	S	S
White mold[e] percentage	50	70	--
Canning quality traits			
Color L-scale	52.2	52.8	52.3
Hydration ratio	1.82	1.80	1.53
Drained weight ratio	1.47	1.46	1.68
Texture[f] (kg/100 g)	31	28	26
Visual rating[g]	4.0	4.2	2.8

[a] Lodging: 1 = Erect, 5 = Prostrate
[b] Agronomic index: 1 = Worst, 7 = Excellent
[c] Yield was averaged over 27 locations from 2008 to 2012
[d] Diseases: R = Resistant, S = Susceptible
[e] White mold: Percentage of disease incidence and severity
[f] Texture: Kg of force needed to compress 100 g of canned beans
[g] Visual rating: 1 = Very undesirable, 4 = Neither desirable nor undesirable, 7 = Very desirable

Release and Research Fee

'Powderhorn' was released by Michigan State University with the option that 'Powderhorn' 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 'Powderhorn' may contact MSU Technologies (*www.technologies.msu.edu*) by phone at 517-355-2186 or by e-mail at msut@msu.edu.

Acknowledgments

Authors

- **J. D. Kelly**, Plant, Soil and Microbial Sciences Department, MSU
- **E. M. Wright**, Plant, Soil and Microbial Sciences Department, MSU
- **G. V. Varner**, Production Research Advisory Board, Michigan Bean Commission
- **C. L. Sprague**, Plant, Soil and Microbial Sciences Department, MSU

Produced by MSU Extension's ANR Communications (*anrcom.msu.edu*).

Suggested Citation

Kelly, J. D., Wright, E. M., Varner, G. V., & Sprague, C. L. (2014). *'Powderhorn': A new variety of great northern bean for Michigan* [E3218]. East Lansing: Michigan State University, MSU Extension.