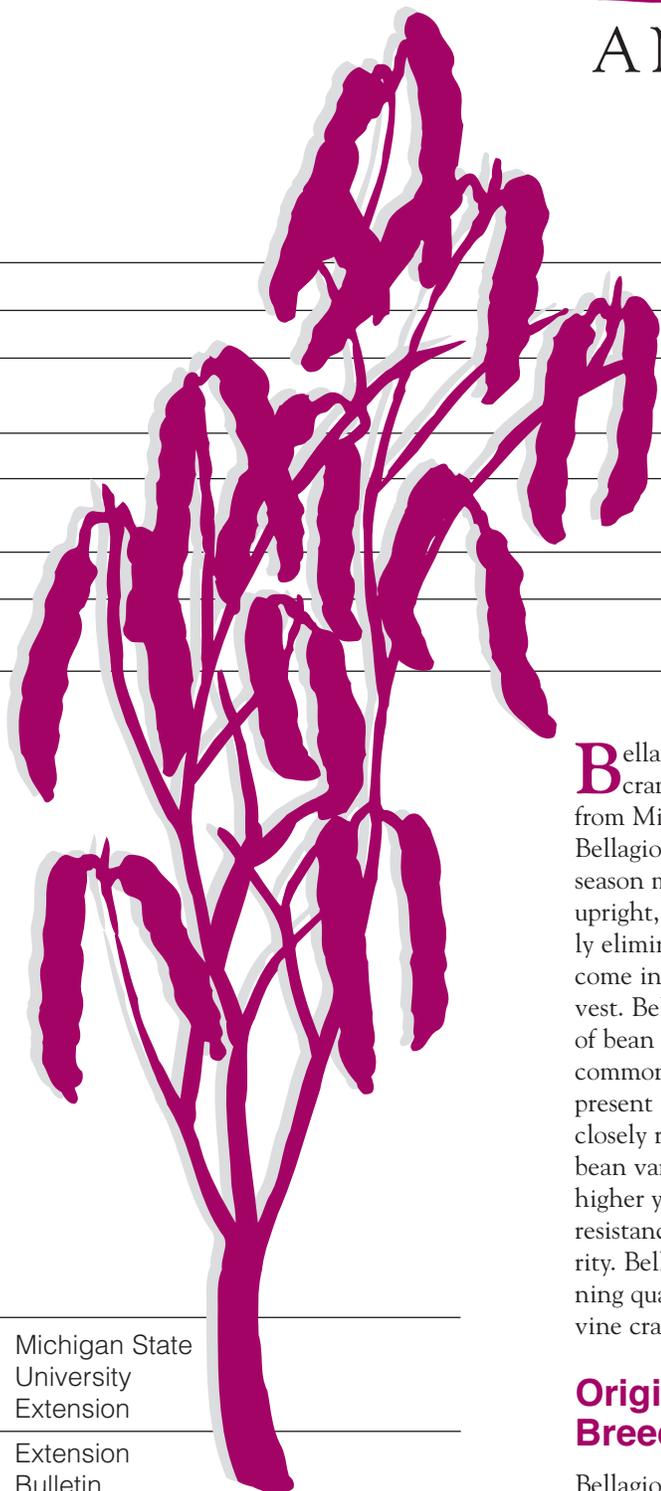


**NEW from  
MSU**

# Bellagio

A NEW CRANBERRY BEAN VARIETY  
*for Michigan*



- Vine cranberry bean variety with improved plant structure.
- Erect growth habit similar to Chianti Cranberry.
- Matures in 96 days, three days earlier than Michigan Improved Cranberry.
- Exhibits uniform maturity with attractive red mottled pods.
- Resistant to strains of anthracnose, rust and mosaic virus commonly found in Michigan.
- Susceptible to white mold.
- Large seed size with excellent canning quality and seed integrity after cooking.

**B**ellagio is a new large-seeded vine cranberry edible dry bean variety from Michigan State University. Bellagio is a competitive yielding, full-season maturing variety with a more upright, vine growth habit that partially eliminates seed spoilage when pods come in contact with wet soil at harvest. Bellagio is resistant to the strains of bean rust, anthracnose and bean common mosaic virus that are typically present in Michigan. Bellagio most closely resembles the Chianti cranberry bean variety in plant appearance, but is higher yielding with additional disease resistance and good dry down at maturity. Bellagio possesses excellent canning quality that is equivalent to other vine cranberry varieties.

## Origin and Breeding History

Bellagio, tested as breeding line C06808, was developed as a more upright vine, cranberry bean variety with enhanced disease resistance and

excellent canning quality. Bellagio was developed from the cross of two breeding lines: ND9904480 and C03129. ND9904480 was a vine cranberry bean breeding line from North Dakota that had a large seed and exhibited superior canning quality but lacked favorable agronomic traits. C03129 was a bush cranberry breeding line from MSU that was selected to possess root rot tolerance from the Mexican black bean variety, Negro San Luis.

The purpose of the cross was to develop a new vine cranberry bean to replace the Michigan Improved Cranberry (MIC) variety that had long been the industry standard for canning quality in cranberry beans. MIC vine cranberry was grown exclusively for Italian canners as bush-type varieties, favored in dry pack markets, lacked adequate canning quality. Local production of MIC has declined because the plants possess a vigorous type-IIIb prostrate vine habit that exhibits uneven and late (over 100 days) maturity, and is susceptible to

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white mold, bean common mosaic virus and anthracnose.

Our goal was to develop a more upright, type-IIIa growth habit with more tolerance to lodging, earlier uniform maturity, resistance to virus and retention of the good canning quality of current cranberry bean varieties. The expectation was that a more upright growth habit would result in a lower incidence of white mold. The cross made in 2004 was advanced to the F6 generation and was entered into yield trials in 2006 under the code number C06808.

## Agronomic and Disease Information

Bellagio exhibits the type-IIIa vine (indeterminate) growth habit in which plants tend to tunnel over the soil surface com-

pared to the decumbent, long vine type-IIIb habit of MIC in which pods are in contact with the soil surface. These structural features are reflected in lodging scores in which Bellagio is rated 2.5, compared to 4.0 for MIC (see the table). The indeterminate variety Chianti with type-IIIb habit has a lodging score 2.0. In contrast, the more upright bush cranberry bean varieties range in lodging from 1 to 2. Plants average 19 inches tall, compared to MIC (16 inches) and Chianti (18 inches). Bellagio flowers in 41 days, two days earlier than MIC and Chianti. It produces a white flower in contrast to the typical pink color of all current commercial cranberry bean varieties. Bellagio is a full-season bean, maturing 96 days after planting. The range in maturity is from 94 to 100 days, depending on season and location. It matures with Chianti and is three days

earlier than MIC, which ranges in maturity from 96 to 105 days. Bellagio has demonstrated the same uniform maturity and dry down as Chianti.

Bellagio has a high agronomic acceptance rating due to its more upright habit, earlier maturity, excellent pod load and favorable high pod placement in the plant canopy. The pod placement helps prevent damage to seed during wet fall conditions when damage often occurs in pods that are in contact with the soil.

Bellagio has been tested for four years (2006–09) in nine locations by Michigan State University, in cooperation with industry colleagues in Michigan. The combined yield data comparisons with six cranberry bean varieties are shown in the table. All yield data was collected from hand- or machine-pulled plots and no significant yield differences were observed between entries because the number of test locations was limited. Across all nine locations, Bellagio yielded 20.4 hundred-weight per acre (cwt/acre) and exceeded the yield of 128 vine and bush cranberry bean entries by 1.2 cwt/acre (6 percent). Yield ranged from a high of over 25 cwt/acre in Gratiot County in 2009 to a low of 18 cwt/acre in Saginaw in 2006.

Over the locations tested, Bellagio out-yielded all the commercial check varieties: Chianti vine (by 7 percent), MIC vine (by 16 percent), Capri bush (by 2 percent), Taylor Hort bush (by 9 percent) and Hooter bush (by 11 percent).

Bellagio produced consistent yield performance that older varieties such as MIC lack (because of their problems with white mold, delayed maturity and inefficient partitioning to the seed). Data illustrate the similarity in yield among contemporary cranberry varieties, so growers' decision in choosing a cranberry variety should be based on criteria other than yield. Growers should follow current recommended practices for fertility and weed control in growing Bellagio beans.

Bellagio possesses the single dominant I gene that conditions provides resistance to seed-borne Bean Common Mosaic Virus (BCMV). MIC is highly susceptible to BCMV and is a potential seed-borne carrier of the virus in Michigan.

Bellagio is resistant to race 73 anthracnose, which is the most prevalent race present in Michigan. All other current

**Table 1. Comparison of agronomic, disease and canning characteristics of Bellagio with other cranberry bean varieties over 2 to 4 years of testing in Michigan.**

Varieties	Bellagio	Chianti	MIC	Capri	Taylor Hort	Hooter
<b>Agronomic Traits</b>						
Growth Type	Type-IIIa	Type-IIIb	Type-IIIb	Type-I	Type-I	Type-I
Growth Habit	Upright Vine	Upright Short Vine	Prostrate Vine	Bush	Bush	Bush
Days to Flower	41	44	44	37	39	40
Days to Mature	96	97	99	95	90	96
Height (inches)	19	18	16	20	18	19
Lodging Score	2.5	2.0	4.0	2.0	1.5	1.3
Selection Index	4.7	4.0	3.8	4.4	3.6	3.6
100 Seed Weight (g)	53.5	55.3	47.0	53.7	48.4	56.2
Yield (Percentage)	100	93	74	98	91	8
<b>Disease Resistance Traits</b>						
BCMV I gene	R	R	S	R	S	R
Anthracnose: Race 73	R	S	S	S	S	S
White Mold (1 to 5)	3.6	2.8	—	1.4	3.5	4.0
<b>Canning Quality Traits</b>						
Hydration Ratio	2.13	2.15	2.1	2.17	2.12	—
Texture (kg)	91.5	92.5	86.0	68.0	44.5	—
Visual Rating (2-year)	4.7	4.2	5.0	3.8	3.1	—
Lodging: 1 = Erect, 5 = Prostrate; 100 Seed Weight – Weight of 100 seeds in grams (G) Selection Index: 1 = Worst, 5 = Average, 9 = Excellent Diseases: BCMV = Bean Common Mosaic Virus, R = Resistant, S = Susceptible White Mold Rating: 1 = Less than 10% disease present, 5 = 90% to 100% disease infection Texture – Kg of force needed to compress 100g of canned beans Visual Rating: 1 = Very undesirable, 4 = Neither desirable nor undesirable, 7 = Very desirable						

cranberry bean varieties are susceptible to anthracnose. Bellagio is similar to other commercial cranberry bean varieties in that it is susceptible to common bacterial blight.

All cranberry beans are highly susceptible to white mold. Bellagio's more upright growth habit does not appear to impart additional resistance compared to vine varieties such as Chianti. For example, even the more upright bush variety Crimson is more susceptible and has a high score of 4.3

Bellagio appears to resist the rust races that are common in Michigan about as effectively as other cranberry bean varieties do.

## Quality Characteristics

Bellagio has a typical large round cranberry bean seed averaging 53.5 g/100 seeds and size ranges from 46 to 62 g/100 seeds. The seed is equivalent to Chianti in size (55.3g), shape and color, and is larger than MIC (47g).

In canning trials, Bellagio has been subjectively rated by a team of panelists as above average in cooking quality. Bellagio rated 4.7 on a scale of 1 to 7, where 7 is best and 4 is mid scale (neither acceptable nor unacceptable). The value is slightly below that of MIC (5.0), but is superior to other cranberry varieties.

Data on hydration ratio following an overnight soak (to leach out the red stipple color) and canning was similar among all cranberry bean varieties, suggesting that they all adequately hydrate. Bellagio's texture rating of 91.5 kg/100g was equivalent to Chianti and slightly higher than MIC (86 kg/100g). (It's interesting to note that the two bush cranberry bean varieties, Capri and Taylor Hort grown for dry pack markets and known to exhibit inferior canning quality, had softer textures of 45 kg/100g to 68 kg/100g.)

Bellagio exhibited uniform cooked color appearance when compared to other commercial cranberry bean varieties in that it also loses the red stipple color during processing. Within the commercial cranberry bean class, Bellagio was equivalent to MIC in visual appearance. MIC has consistently demonstrated the best overall canning quality among cranberry beans.

## Release and Research Fee

Bellagio has been released by Michigan State University with the option that Bellagio 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 production location. It is anticipated that the Bellagio variety will be protected under the Plant Variety Protection (PVP) Act from the USDA Agricultural Marketing Service. Parties interested in licensing Bellagio may contact MSU Technologies by phone at (517) 355-2186 or on the Internet at <http://technologies.msu.edu>.

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By

**J.D. Kelly**, Crop and Soil Sciences Department, Michigan State University

**E.M. Wright**, Crop and Soil Sciences Department, Michigan State University

**G.V. Varner**, Production Research Advisory Board, Michigan Bean Commission, 1031S US27, St. Johns, Michigan. MI 48879

and

**C. L. Sprague**, Crop and Soil Sciences Department, Michigan State University

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