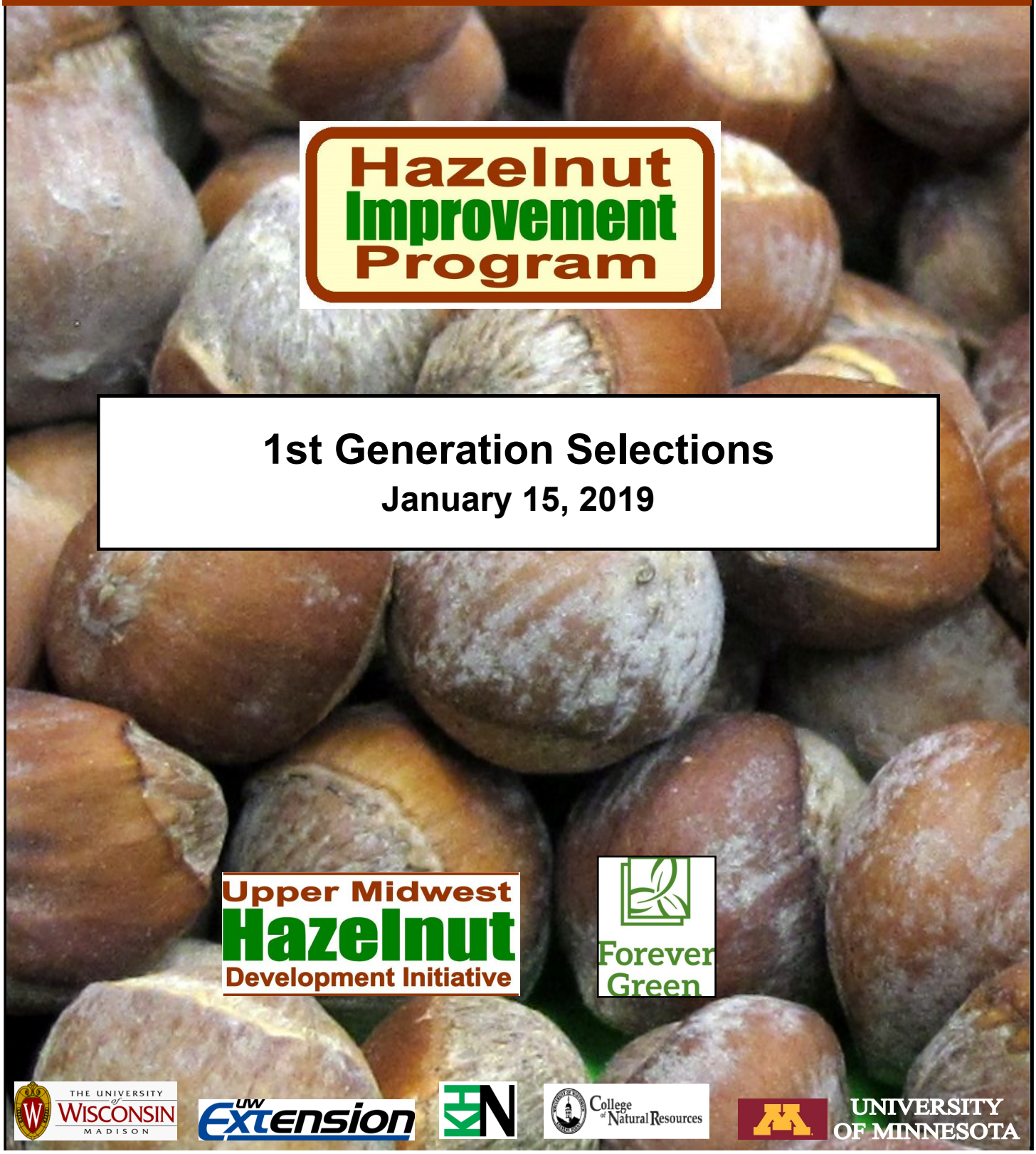
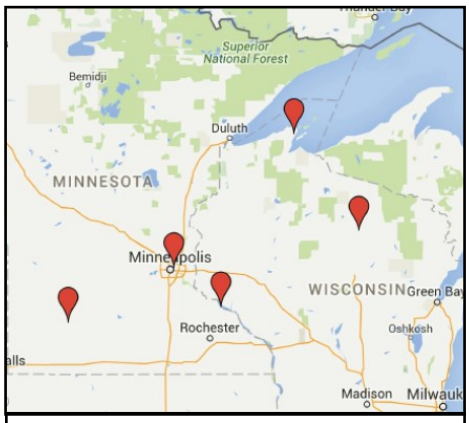
Upper Midwest Hazelnut Development Initiative



The **Upper Midwest Hazelnut Development Initiative** (UMHDI) is a collaboration of researchers at the University of Wisconsin and University of Minnesota working with early-adopter growers and stakeholders to develop a sustainable hazelnut industry in the Upper Midwest. The **Hazelnut Improvement Program** (HIP) is our participatory hazelnut breeding program that is developing improved and proven germplasm for growers. Our plant improvement program has two approaches:

1st Generation Selections

Early-adopter growers have been planting seedling hybrid hazelnuts across the Upper Midwest since the early 1990s. In cooperation with the growers, we've been screening those plantings for the top plants and then evaluating the best in our five Replicated Germplasm Trials. After more than a decade of evaluation we have selected a cohort of genotypes for propagation and release to growers. These genotypes are profiled in this document and were selected primarily based on high and consistent kernel yields. The nuts are generally smaller than their European hazelnut cousins, but the quality is excellent. With an American hazelnut growth form, we envision these being grown in hedgerows with nuts harvested directly from the plants.



Our **1st Generation** genotypes have been selected based on performance at five trial locations in WI and MN.

2nd Generation Cultivars

In 2013 we began making controlled crosses with our top selections and pollen from top *Corylus avellana* germplasm in an effort to combine traits toward even better plant material, with a focus on increasing kernel size and percent kernel. Nut production has just begun on the oldest progeny from these crosses and we intend for these plants to serve as a pipeline for continued germplasm improvement. Developing this material is a long-term project and will required sustained commitment by public and private partners.

Development of **2nd Generation** genotypes is underway through evaluation of progeny from our controlled crosses.

Top 5 1st-Generation Selections For Traits of Interest. The focus of our 1st Generation selection program has been selecting winter-hardy and EFB-resistant genotypes with consistent and above average kernel yields.

Selection	Kernel Wt. (g)	Selection	Round Kernel (100=round)	Selection	% Kernel	Selection	Yield Density (g/sq ft)	Selection	Ave. Yield (g/plant)
HandFats	0.81	HeasB	96	Rose 9-2	45.5	Arb 4-3	13.2	Rose 9-2	412
Shep Rosy	0.77	Rose 18-10	95	HandFats	42.7	SPC-2D5	12.9	Gibs 5-15	405
Minar 342	0.75	HandFats	94	Shep Rosy	42.0	Price W-41	11.0	SPC-2D5	302
Rose 18-10	0.68	Gibs 5-15	92	Rose 18-10	41.9	Cuddy 2-28	10.6	Stap N2-7	291
Stap N2-7	0.66	Cuddy 2-28	88	Stap N2-7	39.4	HeasB	9.9	Minar 342	256

Evaluating the First Generation Selections

The vast majority of the on-farm plant material that was screened for top plants and then evaluated in the replicated performance trials originated from the Badgersett Research Corporation breeding program, which in turn originated from the collections of Carl Weschke. Exact parentage is unknown, but includes *Corylus americana* (American hazelnut), *Corylus avellana* (European hazelnut), and possibly *Corylus cornuta* (Beaked hazelnut). Genetic diversity analysis found a high level of genetic diversity among the accessions in our performance trials (Braun et al, 2018) verifying that genetic gain could be made through our search and screen program. Our primary interest has been to find winter-hardy, EFB resistant, high and consistent yielding plants with good kernel quality. Our top genotypes are shown in the pages that follow.

The criteria and metrics presented for our top selections are described in detail below.

USDA Nut and Kernel Size: In-shell nut and kernel diameters are measured on three axes of ten nuts each from each selection to determine an average width. This width is the minimum diameter and the values are presented in relation to the USDA grading sizes used for Oregon-grown nuts.

In-Shell Nut and Kernel Sphericity: The three dimensions are used to calculate both sphericity and shape index, as described by Mehlenbacher (2003), which distinguishes between different kinds of non-round shapes. The nuts are characterized as long, round, or oblate.

Kernel Weight: Kernel weight is the weight of the kernel at a moisture content of 6% or less.

% Kernel: To determine kernel percentage 10 typical in-shell nuts from each plant are selected, weighed and cracked. The kernels from these subsamples are reweighed to determine percent kernel, which is the proportion of total nut weight that is kernel. Percent kernel is a function of both shell thickness and percent fill. Nuts with air spaces between the kernel and shell may have lower kernel percentages, but are easier to crack.

Fiber: A rating system of 0 to 3 is used to rate the amount of kernel around a kernel. 0 means there is no fiber and 3 means the kernel is completely covered with a thick fiber layer.

Eastern Filbert Blight: Severity of EFB infection is rated in the fall after leaf drop using the index developed by Pinkerton et al. (1992); 0 = no detectable EFB, 1 = a single canker, 2 multiple cankers on a single branch, 3 = multiple branches with cankers, 4 = greater than 50% of branches with cankers, and 5 = all branches with cankers except for basal sprouts. The presence of EFB does not necessarily disqualify a plant as it is possible the plants are exhibiting tolerance.

Big Bud Mite: The percentage of buds with mite infestation (blasted buds) for each plant was rated from 0—5 in the spring and fall of 2017 at three trial locations and used to calculate a weighted average. O means no blasted buds and 5 means 75% or more of the buds were infested.

Yield Density: Each plant in the performance trials is individually harvested. The nuts are dried and husks removed to determine a total in-shell weight. The weight is multiplied by the % kernel to determine a total kernel yield. Yield density is determined by dividing the total plant yield by the canopy coverage of the plant as measured by the width of the crown. Yield density is a better measure of the yield potential of the plant because it accounts for plant size.

A Note About Yields and Kernel Size:

All of the plants described in this document have produced yields at the trial locations we believe are capable of supporting commercially viable production (Fischbach and Braun, 2017). However, nut and kernel size is generally smaller compared to European cultivars. The commercial success of these selections will depend on to what extent processing and fresh-eating markets will accept the smaller kernels.

Table 1. Performance and characteristics of the top 20 hybrid genotypes selected from the UMHDI replicated performance trials

Selection[a]	Overall Rank	Origin	Bush Shape	Suckering[b]	In-Shell Nut Width (mm)[c]	Kernel Width (mm)	Kernel Weight (g)	% Kernel	Nut Sphericity[d]	Kernel Sphericity[d]	Fiber[e]	EFB[f]	Kernel Yield (g/plant)[h]	St. Paul Yield Density[i]
Rose9-2	1	Rosemount, MN	narrow/upright	3.0	14.9	10.4	0.62	45.5	88	87	2.7	0.0	412	9.0
PriceW41	2	Northfield, MN	narrow/upright	3.0	15.3	10.1	0.58	39.4	92	87	2.0	0.0	226	11.0
Minar342	3	New Prague, MN	narrow/upright	3.5	18.6	10.6	0.75	38.0	95	82	1.3	2.0	256	6.5
Rose18-10	4	Rosemount, MN	narrow/upright	3.0	15.6	11.0	0.68	41.9	94	95	2.0	0.0	168	6.9
SpC-2D5	5	St. Paul, MN	narrow/upright	3.0	15.9	11.3	0.65	37.4	85	80	1.3	0.0	302	12.9
StapN2-7	6	Staples, MN	wide	4.5	16.9	9.3	0.66	39.4	90	79	1.0	0.0	291	9.0
ShepRosy	7	Viola, WI	narrow/upright	1.5	17.9	10.6	0.77	42.0	92	82	0.3	0.0	178	5.4
Cuddy2-28	8	Maiden Rock, WI	narrow/upright	2.0	14.4	9.4	0.48	35.3	92	88	0.3	0.0	141	10.6
Arb4-3	9	Chanhassen, MN	wide	2.5	14.3	9.8	0.50	38.5	89	85	2.0	0.0	211	13.2
Gibs5-15	10	Montevideo, MN	wide	4.0	16.2	9.9	0.54	29.1	95	92	2.0	0.0	405	9.0
Eric4-21	11	Lake City, MN	narrow	3.5	16.2	9.0	0.57	31.0	96	94	0.7	0.0	171	5.2
HandFats	12	Montevideo, MN	variable	4.0	15.7	12.0	0.81	42.7	91	94	2.0	1.0	243	6.6
Arb7-1	13	Chanhassen, MN	variable	3.0	15.5	10.7	0.49	37.5	91	87	1.5	0.0	162	8.2
Arb7-21	14	Chanhassen, MN	wide	3.5	16.0	11.1	0.54	36.9	90	85	1.3	0.0	153	6.2
HeasB	15	Plainview, MN	narrow	3.0	14.7	10.2	0.48	31.5	95	96	1.7	0.0	181	9.9
StapS2-7	16	Staples	intermediate	4.5	15.9	8.7	0.54	34.3	87	77	1.0	0.0	184	5.9
Gunth PC	17	Osceola, WI	intermediate	3.0	15.0	10.3	0.43	28.9	92	98	2.0	0.0	134	6.1
StapN7-6	18	Staples, MN	v wide	5.0	15.8	10.8	0.56	34.3	91	87	2.3	0.0	294	8.3
Gibs6-23	19	Montevideo, MN	wide	4.0	13.1	10.0	0.49	37.4	86	87	2.0	0.0	164	6.5
MuntBD	20	Warba, MN	variable	3.0	14.2	9.7	0.47	41.0	86	81	1.5	1.3	237	7.1

[a] Selections shown in **bold** were in the top 8 based on performance through 2016 as reported by Braun et al., 2018; highlighted selections are our top genotypes

[b] The amount of suckering from the crown rated 0-5: 0=no suckering, 5=profuse rhizomatous suckering

[c] An in-shell nut has three dimensions: height is measured from the apical scar to the tip, width is the diameter at the widest dimension, depth is the diameter at the narrowest dimension

[d] Mohensin's (1970) sphericity as calculated by (width/height)*100. A round nut has a sphericity of 100.

[e] The thickness of fiber surrounding the kernel rated 0-3: 0=no fiber, 3=thick fiber completely surrounding the kernel

[f] Severity of EFB infection rating of Pinerton et al (1992): 0=no detectable cankers, 5=all branches with cankers except basal sprouts

[h] Average per plant kernel yield from age 5 through 10 at St. Paul, not all plants have 6 years of yield data

[I] Average per plant kernel yield density from 2014-2017 at St. Paul, calculated by dividing the total plant yield by the cross sectional area of the plant canopy

In-shell, Shells, Raw Kernels, and Blanched Kernels From the Top 10 Overall 1st Generation Selections (shown in no particular order)

Arb 4-3	Price W41	Cuddy 2-28	Gibs 5-15	Rose 18-10	Shep Rosy	Stap N2-7	SPC-2D5	Minar 342	Rose 9-2

UMHDI 1st Generation Selections

Rose 9-2

Upper Midwest Hazelnut Development Initiative

Why It Was Selected

This is our best all-around plant with consistently high yields and excellent percent kernel. The only negative is the thick fiber layer around the kernel, but it is easily removed with roasting.

Origin/Parentage

Rose 9-2 is a hybrid seedling selected from a University of Minnesota research planting in Rosemount, MN.

In-Shell Nut and Kernel

Both the kernel and nut are slightly long. The kernel has a thick fiber layer, but roasting is effective in removing the fiber and pellicle and flavor is excellent. The shell is thin with an average kernel percentage around 45%.

Plant Form

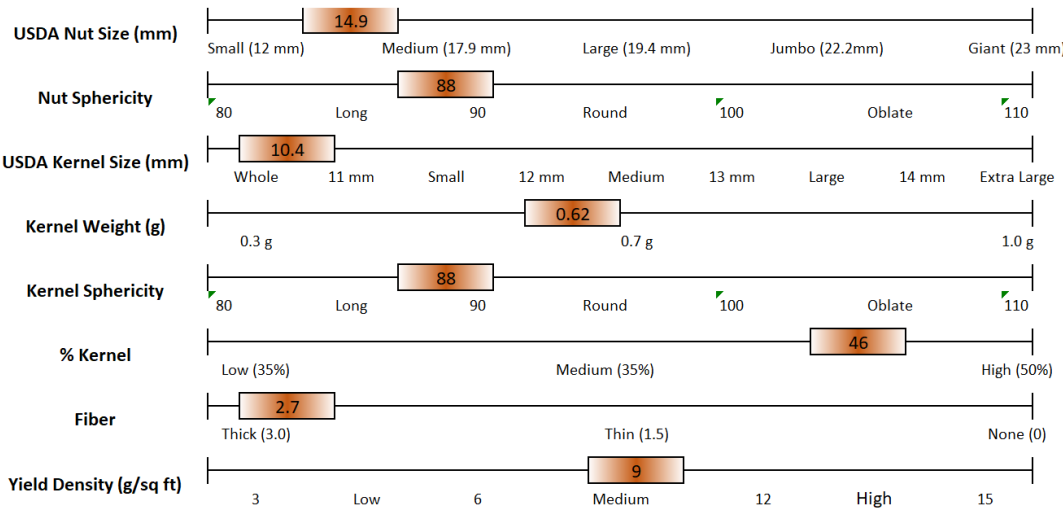
The plant has a typical American hazelnut growth form with an expanding crown and branches bending to the ground in the fall when loaded with nuts. The plant has many stems, but does not sucker or spread profusely.

Disease and Pest Resistance

No EFB has yet been observed on this plant after 8 years of evaluation at five trial locations. Big bud mite infestation has been observed, with the plant having a 1.0/5.0 weighted rating in 2017 across three locations.

Yield

Rose 9-2 is the highest yielding UMHDI selection on a lbs of kernel per plant basis and is among the most consistent yielders from year-to-year. Despite the high per plant yield, the yield density is medium, due to the relatively large size of the plant.



Overall Rank

1/126

UMHDI 1st Generation Selections

Price W41

Upper Midwest Hazelnut Development Initiative

Why It Was Selected

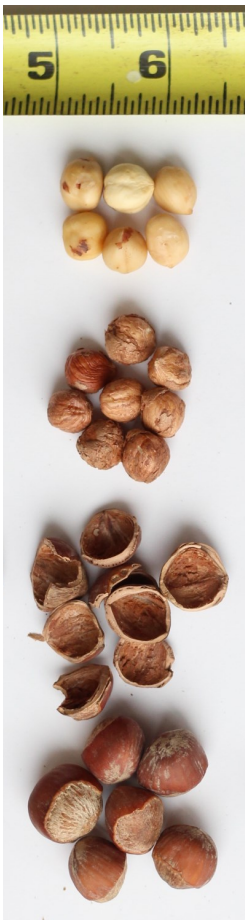
This is another all-around good plant with a growth form that is slightly more compact than Rose 9-2.

Origin/Parentage

Price W41 is a hybrid seedling selected from a private planting near Northfield, MN.

In-Shell Nut and Kernel

The in-shell nut is round and the kernel is slightly long with a pointed tip typical of hazelnut kernels. Kernel size and weight is average for the Badgersett material. There is some fiber around the kernel, but it is easily removed with roasting. The shell is relatively thin with an average kernel percentage around 39%.



Plant Form

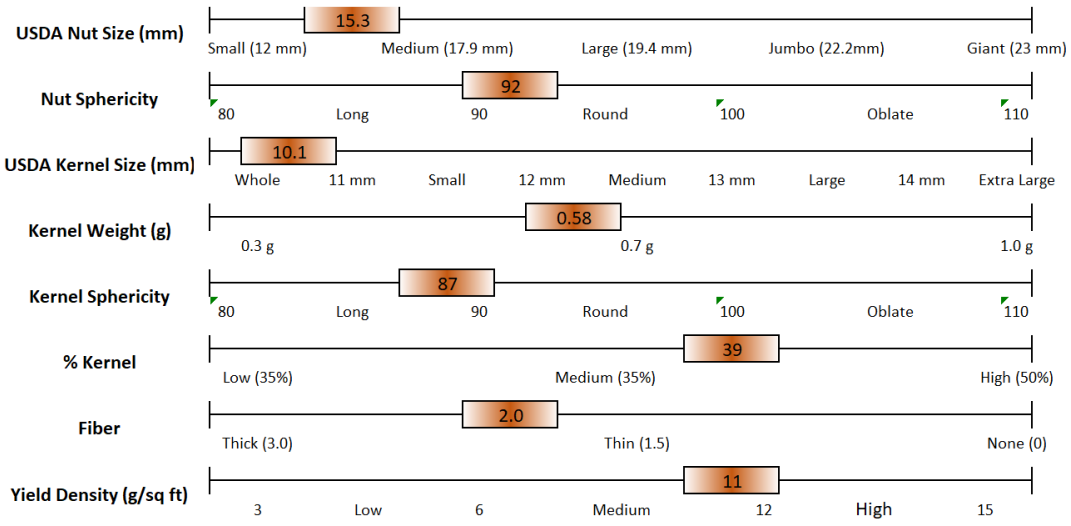
The plant has a typical American hazelnut growth form but is more upright than Rose 9-2. The plant has many stems, with only moderate suckering.

Disease and Pest Resistance

No EFB has yet been observed on this plant after 8 years of evaluation at five trial locations. Big bud mite infestation has been observed, with the plant having a 1.5/5.0 weighted rating in 2017 across three locations.

Yield

Price W41 has been one of the more consistent yielding plants in the trials and with a relatively compact form, has had the 2nd highest yield density.



Overall Rank

2/126

UMHDI 1st Generation Selections

Minar 342

Upper Midwest Hazelnut Development Initiative

Why It Was Selected

Minar 342 has the largest nut size of our evaluated selections. Annual yields have been consistent from year-to-year and across the trial locations. The main negative is the plant does have EFB at some trial locations, though sporulating lesions have remained small and stem dieback has not yet occurred, suggesting tolerance to EFB.

Origin/Parentage

Minar 342 is a hybrid seedling selected from a private planting near New Prague, MN.

In-Shell Nut and Kernel

The in-shell nut is very round, but the kernel is long. There is very little fiber on the kernel. The shell thickness is moderate at 38% kernel. Flavor is excellent and is slightly sweet.

Plant Form

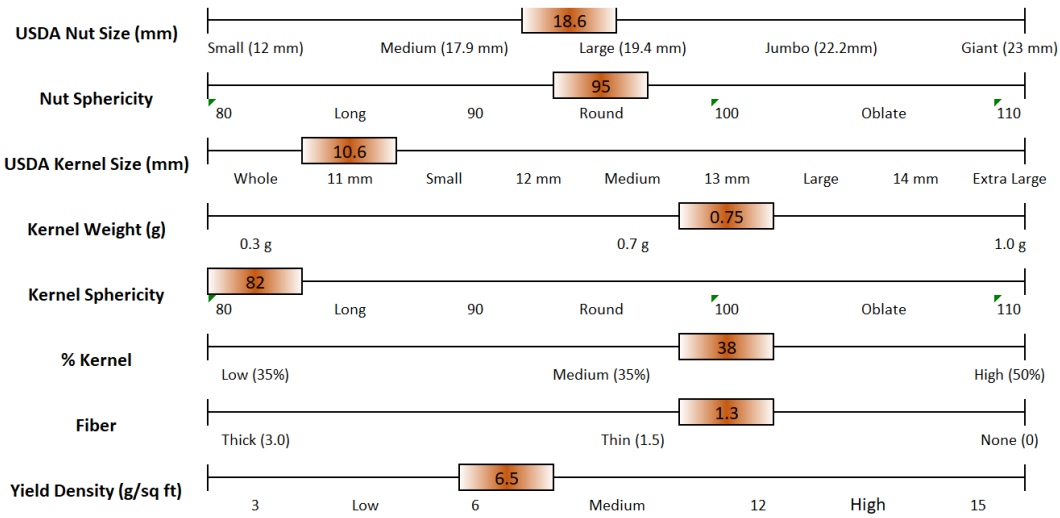
The plant form is more typical of European hazelnuts with a few upright stems and only moderate suckering. It is one of the taller selections in the trials.

Disease and Pest Resistance

EFB lesions have been observed on Minar 342 at multiple trial locations, though stem mortality has not yet occurred after 8 years. Big bug mite damage has been observed with a 2.0/5.0 weighted rating across three locations in 2017.

Yield

Minar 342 ranks in the top 15 for per plant yields and has been relatively consistent from year to year in the trials. Bearing began generally a year later than most other selections in the trials.



Overall Rank

3/126

UMHDI 1st Generation Selections

Rose 18-10

Upper Midwest Hazelnut Development Initiative

Why It Was Selected

Rose 18-10 was selected mainly because of its relatively large nut size, thin shell, and round kernel. Yields have been consistent, but moderate. Like other selections nut size tends to be larger on more fertile sites with longer growing seasons.

Origin/Parentage

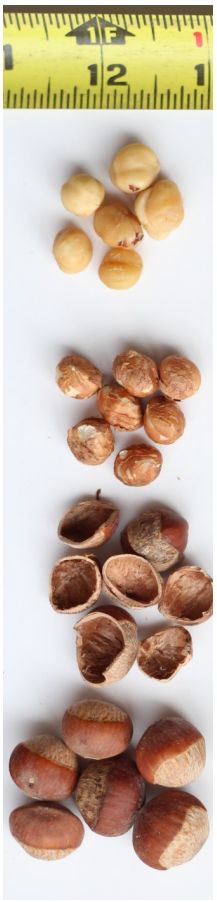
Rose 18-10 is a hybrid seedling selected from a University of Minnesota research planting in Rosemount, MN.

In-Shell Nut and Kernel

The in-shell nut and kernel are round. The shell is thin with 42% kernel. There is a fiber layer around the kernel that can be removed with roasting.

Plant Form

The plant form is typical of American hazelnut with many stems, though compared to other selections the shrub is relatively upright and compact.

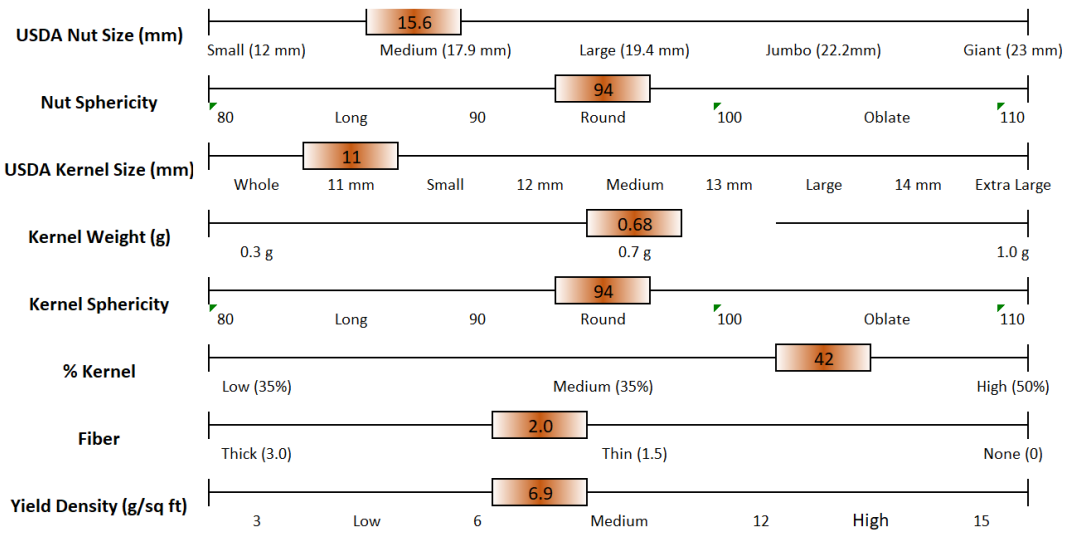


Disease and Pest Resistance

No EFB lesions have been observed on Rose 18-10 after 8 years in evaluation at multiple locations. Big bug mite damage has been observed with a 1.7/5.0 weighted rating across three locations in 2017.

Yield

Compared to other selections Rose 18-10 has only moderate yields, but the plant has been a consistent producer from year to year. With a relatively compact growth form, yield density ranks in the top 10.



Overall Rank

4/126

UMHDI 1st Generation Selections

SPC-2D5

Upper Midwest Hazelnut Development Initiative

Why It Was Selected

SPC-2D5 is a newer entry in the performance trials with only four years of production data, but it is already one of the highest yielding selections with the 6th highest yield density.

Origin/Parentage

SPC-2D5 is a hybrid seedling selected from a University of Minnesota research planting in St. Paul, MN.

In-Shell Nut and Kernel

Both the in-shell nut and kernel are slightly long. There is only a small amount of fiber that is easily removed with roasting. The in-shell nuts have an attractive appearance though the shells are relatively thick with a 37% kernel percentage.

Plant Form

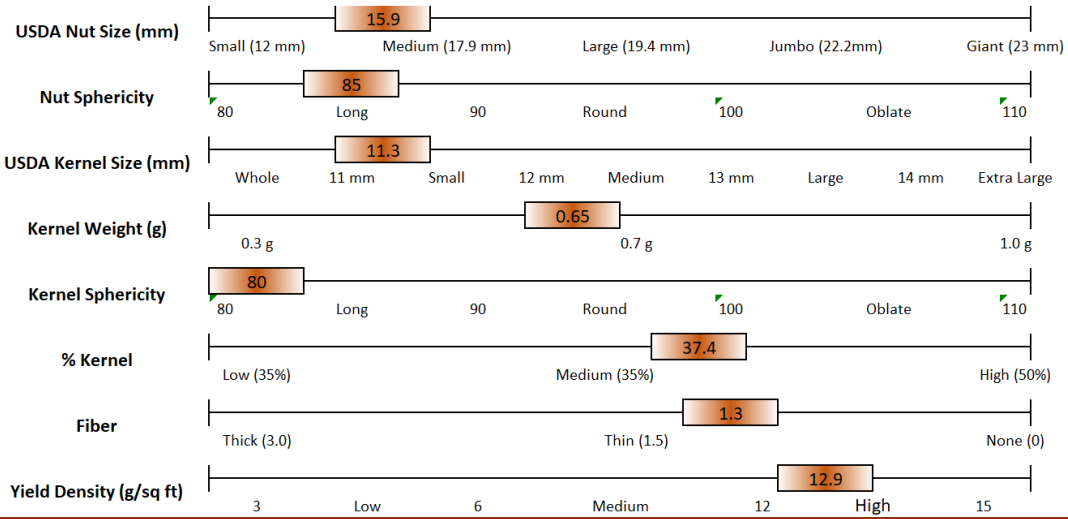
The plant form is typical of American hazelnut with many stems, though compared to other selections the shrub is relatively upright and compact, which contributes to its high yield density.

Disease and Pest Resistance

No EFB lesions have yet been observed on SPC-2D5. Big but mite damage has been observed and in 2017 had a weighted rating of 2.5/5.0.

Yield

SPC-2D5 is a high yielding plant and has averaged 300 lbs of kernel per plant per year at St. Paul and 120 at Bayfield. Yield density ranks in the top 10 due to the high yields and relatively compact growth form.



Overall Rank

5/126

UMHDI 1st Generation Selections

Stap N2-7

Upper Midwest Hazelnut Development Initiative

Why It Was Selected

Stap N2-7 is very similar to Stap N7-6 in yield, but has a slightly larger and longer kernel. It ranks in the top 10 for both overall yield per plant and kernel weight.

Origin/Parentage

Stap N2-7 is a hybrid seedling selected from a University of Minnesota research planting in Staples, MN.

In-Shell Nut and Kernel

The in-shell nut is round with a tapered end and the kernel is longish. Kernel percentage is high for these first generation selections at 39%. There is a slight fiber layer that is easily removed with roasting.

Plant Form

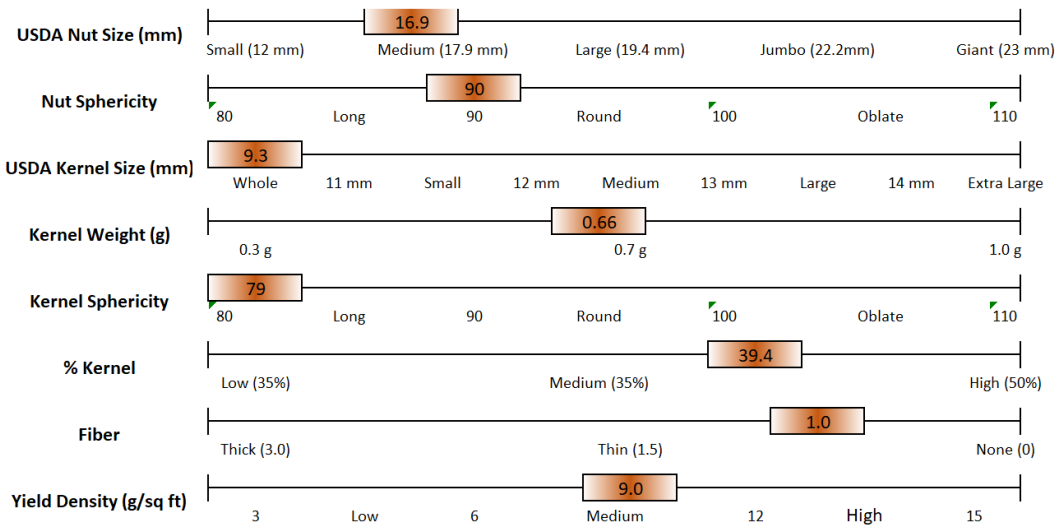
The plant form is wide with branches drooping under heavy yields. The plant tends to sucker with the base getting wider each year.

Disease and Pest Resistance

No EFB lesions have yet been observed on Stap N2-7. Big but mite damage has been observed and in 2017 had a weighted rating of 1.8/5.0.

Yield

Stap N2-7 is a high yielding plant and has averaged close to 300 lbs of kernel per plant per year at St. Paul. Yield density is medium due mainly to the wide growth habit.



Overall Rank

6/126

UMHDI 1st Generation Selections

Shep Rosy

Upper Midwest Hazelnut Development Initiative

Why It Was Selected

Shep Rosy was selected as it is a relatively compact plant with a large kernel and high kernel percentage. It has not consistently filled kernel in Bayfield and may only be suited for areas with longer growing season.

Origin/Parentage

Shep Rosy is a seedling selected from a private planting in Viola, WI. The parentage is unknown, but is a hybrid originating from Forest Agriculture Enterprises.

In-Shell Nut and Kernel

Shep Rosy has one of the largest kernels of our selections. The kernel is somewhat long, but with no fiber. The shell is thin with a kernel percentage around 42%.

Plant Form

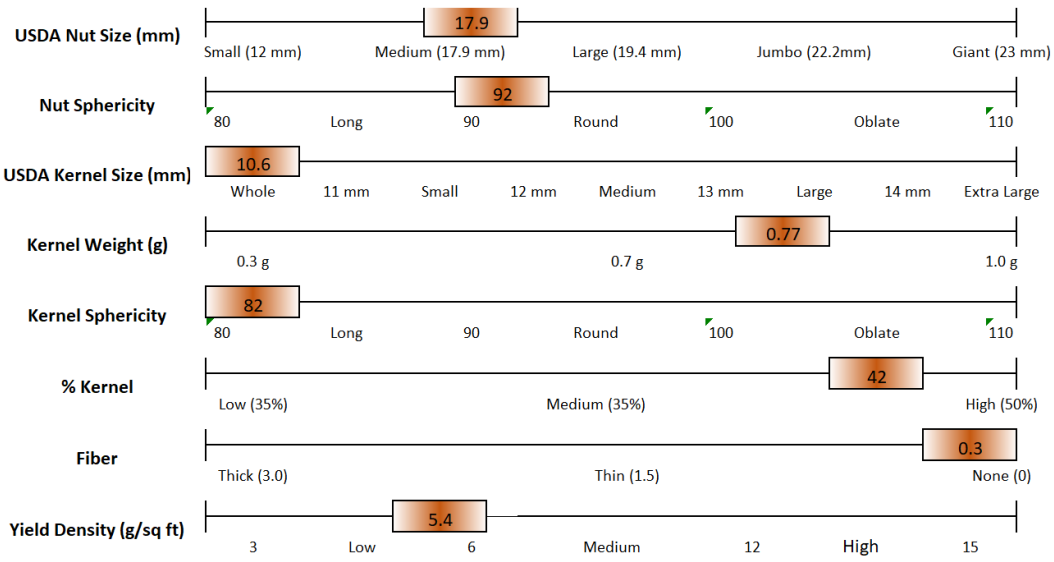
The plant form is compact and relatively tall with very little suckering. The nut is very exposed in the involucre and has a European hazelnut look.

Disease and Pest Resistance

No EFB lesions have yet been observed. Shep Rosy experienced big bud mite damage in 2017 with a weighted rating of 1.4/5.0.

Yield

Although Shep Rosy ranks in the top ten for kernel size and percent kernel its per plant yield and yield density are lower compared to other selections. This is due in part to a relatively large plant size and low yield density, but also because the clusters tend to have one or two nuts per cluster.



Overall Rank

7/126

UMHDI 1st Generation Selections

Cuddy 2-28

Upper Midwest Hazelnut Development Initiative

Why It Was Selected

Cuddy 2-28 is the quintessential Midwestern hazelnut. It is high yielding with a compact shrub-like growth form. The nuts are small, but round with no fiber and excellent flavor.

Origin/Parentage

Cuddy 2-28 is a hybrid seedling selected from a private planting in Maiden Rock, WI.

In-Shell Nut and Kernel

Both the in-shell nut and kernel are round to slightly long. Kernel percentage is low at 35%, but the shell is relatively thin. There is no fiber.

Plant Form

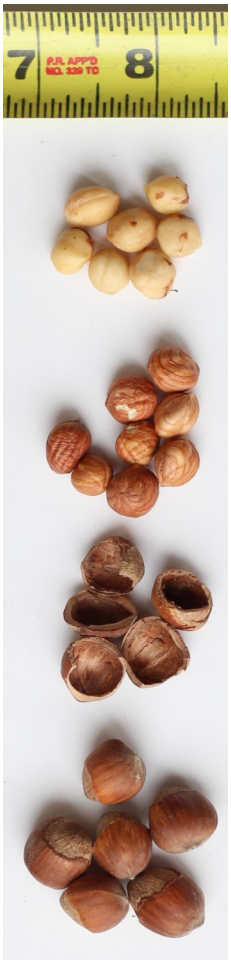
The plant form is compact and upright with very little suckering. It is precocious and high yielding which helps maintain its compact size.

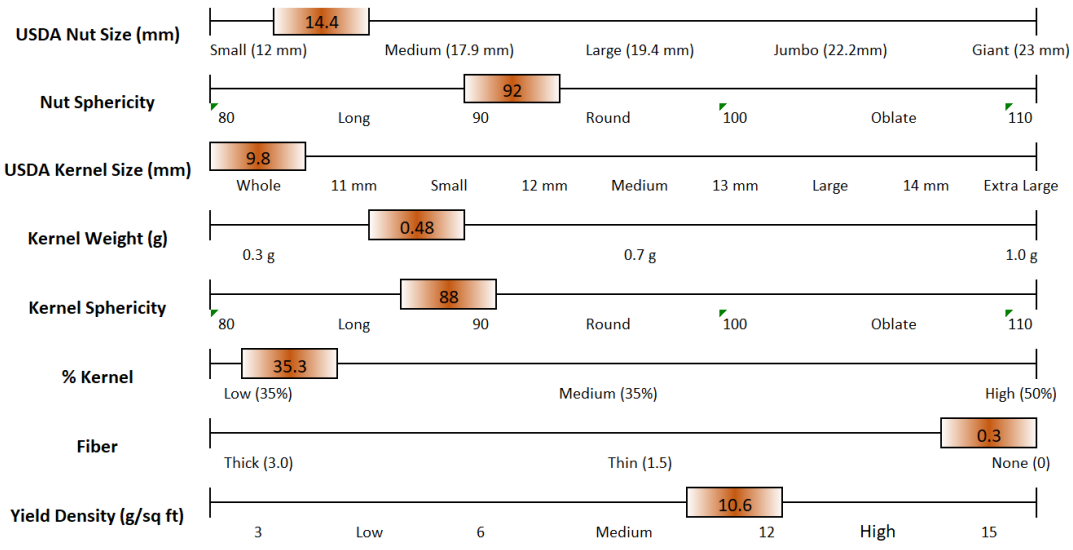
Disease and Pest Resistance

No EFB lesions have yet been observed on Cuddy 2-28. Interestingly, compared to other selections, there was only minor big bud mite damage in 2017 with a weighted rating of 0.9/5.0.

Yield

Cuddy 2-28 ranks in the top 15 for total yield and in the top 10 for yield density. The yields have been consistent from year-to-year and across the trial locations. The nuts tend to ripen later than other selections and if harvested too early the husks do not easily separate from the nuts.





Overall Rank

8/126

UMHDI 1st Generation Selections

Arb 4-3

Upper Midwest Hazelnut Development Initiative

Why It Was Selected

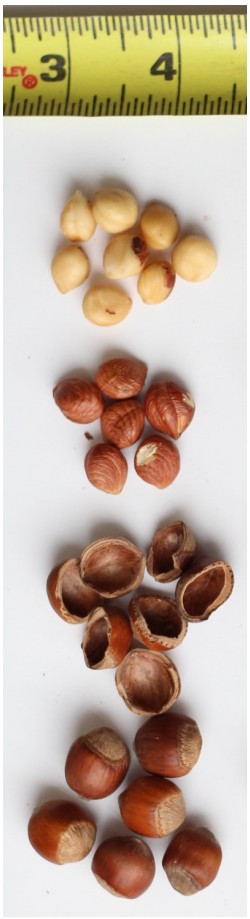
Arb 4-3 is a newer entry into the performance trials and was selected because it has the highest ranked yield density of all the selections mainly due to its precocity and compact growth form.

Origin/Parentage

Arb 4-3 is a hybrid seedling selected from a University of Minnesota research planting in Chanhassen, MN.

In-Shell Nut and Kernel

Both the in-shell nut and kernel are mainly round with a slight taper. There is a moderate fiber layer that is easily removed with roasting. Though the kernels are relatively small compared to other selections, the nuts are flavorful and roast to an attractive white color.



Plant Form

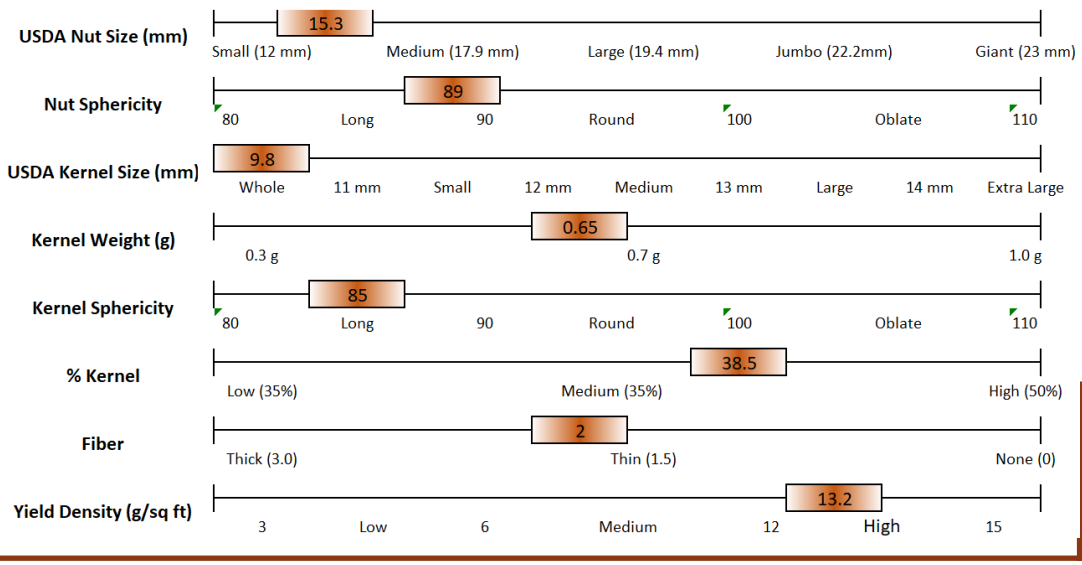
The plant form is typical of American hazelnut with many stems, though compared to other selections the shrub is relatively upright and compact, which contributes to its high yield density.

Disease and Pest Resistance

No EFB lesions have yet been observed on Arb 4-3. Big but mite damage has been observed and in 2017 had a weighted rating of 2.1/5.0.

Yield

Like SPC-2D5, Arb 4-3 has a high yield density and compact growth form, making it a good selection for the hedgerow production system.



Overall Rank

9/126

UMHDI 1st Generation Selections

Gibs 5-15

Upper Midwest Hazelnut Development Initiative

Why It Was Selected

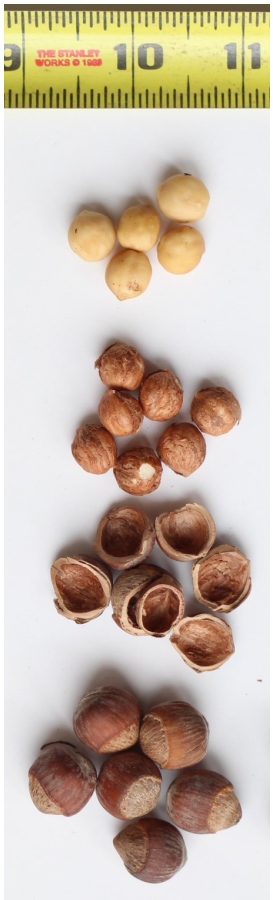
Gibs 5-15 was selected due to its high per plant yield and very round high quality kernel.

Origin/Parentage

Gibs 5-15 is a hybrid seedling selected from a private planting in Montevideo, MN. The parentage is unknown, but is a hybrid originating from Badgersett Research Corporation.

In-Shell Nut and Kernel

Both the in-shell nut and kernel are round. Kernel percentage is very low at 29% due mainly to the thick shell. There is some fiber around the kernel that is easily removed with roasting. Flavor is excellent.



Plant Form

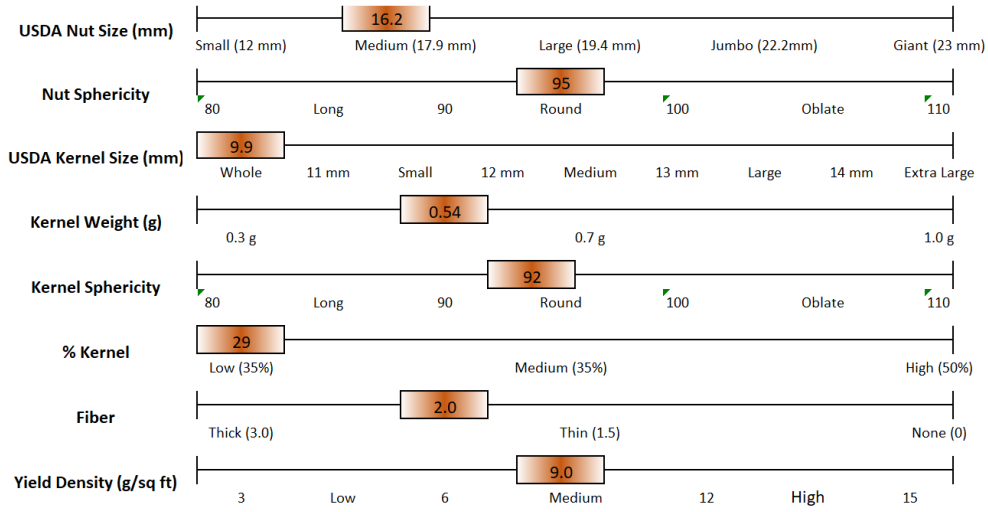
The plant is wider than it is tall with a very typical American hazelnut appearance. Although not as profusely as other selections, the plant does produce suckers resulting in base that gets wider over time.

Disease and Pest Resistance

No EFB lesions have yet been observed on Gibs 5-15. Compared to other selections, there was only minor big bud mite damage in 2017 with a weighted rating of 1.3/5.0.

Yield

Gibs 5-15 ranks in the top 5 for total per plant yield, due in part to it's wide and large growth form. The yields have been consistent from year-to-year and across the trial locations, although yields have been higher at the trial locations with better soils and longer growing season. For example average yields at St. Paul have been more than 400 lbs per year, but only 75 at Bayfield.



Overall Rank

10/126

UMHDI 1st Generation Selections

Eric 4-21

Upper Midwest Hazelnut Development Initiative

Why It Was Selected

Eric 4-21 was selected for its overall performance as the yields have consistently ranked in the top 15 at all tested locations.

Origin/Parentage

Eric 4-21 is a hybrid seedling selected from a private planting in Lake City, MN. The parentage is unknown.

In-Shell Nut and Kernel

Both the in-shell nut and kernel are round. Kernel percentage is low at 31% due mainly to the thick shell. There is little fiber around the kernel that is easily removed with roasting. Eric 4-21 has not filled the kernel consistently well at the Bayfield location even though it has at the St. Paul location, suggesting it should be grown further south in a longer growing season.

Plant Form

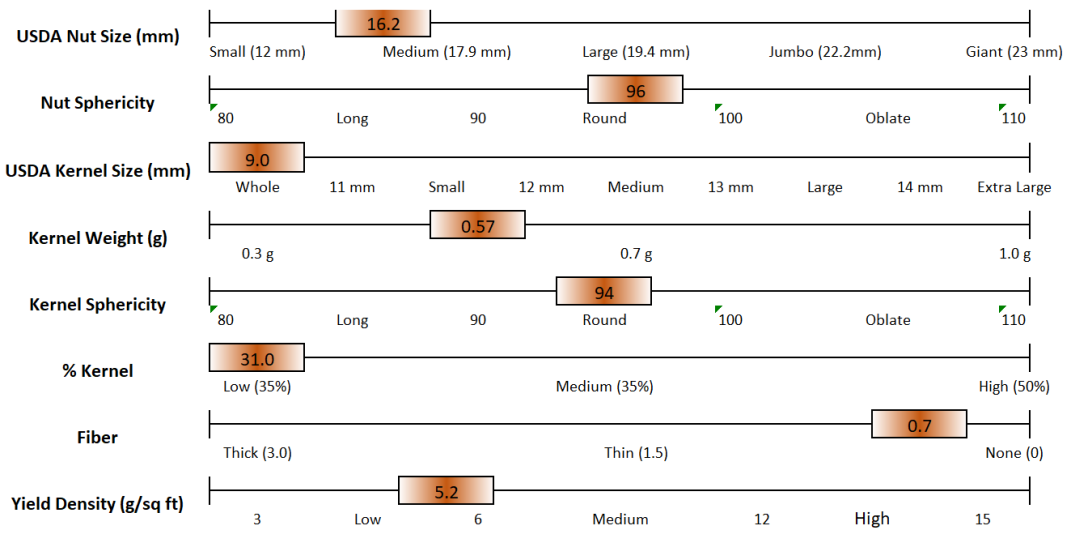
The plant form is compact and is precocious. It produces very large and fleshy involucres with branches weighted to the ground in the fall.

Disease and Pest Resistance

No EFB lesions have yet been observed on Eric 4-21. Compared to other selections, there was only minor big bud mite damage in 2017 with a weighted rating of 2.0/5.0.

Yield

Because Eric 4-21 produces so many and such large clusters the yield appears high. But, kernel size and weight are only average and percent kernel is relatively low. That said, because of the number of clusters Eric 4-21 ranks in the top 25 for yield. The main attribute of Eric 4-21 is its consistency. It has produced good yields every year in the trials.



Overall Rank

11/126

UMHDI 1st Generation Selections

Hand Fats

Upper Midwest Hazelnut Development Initiative

Why It Was Selected

Hand Fats was selected due to its large kernel and high kernel percentage.

Origin/Parentage

Hand Fats is a hybrid seedling selected from a private planting in Montevideo, MN. The parentage is unknown.

In-Shell Nut and Kernel

Hand Fats has one of the largest kernels of our selections ranking in the top 5 for both weight, size, and % kernel. There is fiber around the kernel that can be removed with roasting or blanching.

Plant Form

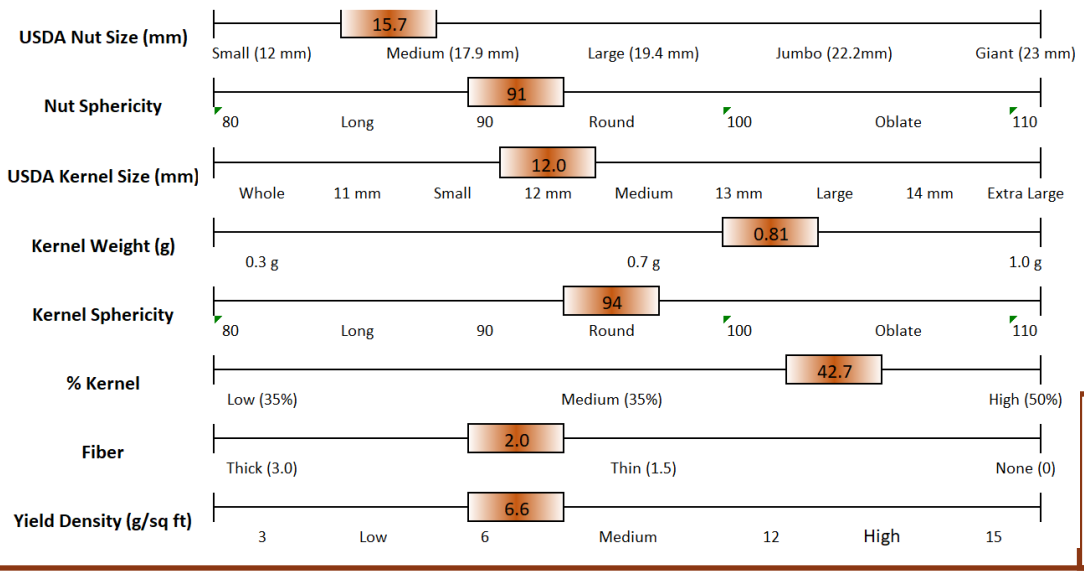
The plant is vigorous and suckers making it a fairly large plant. In high yielding years the branches will bend to the ground.

Disease and Pest Resistance

Some small EFB lesions have been found on Hand Fats and the plants are being closely monitored. No stem mortality has occurred and the plant appears tolerant. Compared to other selections, there was very little infestation from BBM in 2017, though it is not yet known if the plant is resistant to BBM.

Yield

Hand Fats ranks in the top ten for total kernel yield, due mainly to the large kernel size. However, yield density ranks 50th overall because the plant is relatively large.



Overall Rank

12/126