Researchers find spuds that could foil type 2 diabetes

By SARAH BROWN
The Prairie Star

BOZEMAN, Mont. – Montana State University researchers have found several varieties of potatoes that could foil one of the scourges of the modern world: type 2 diabetes.

Researchers in the Sands' Research Lab at MSU's Plant Science Department have found low glycemic index potatoes that do not cause the rapid spike in blood sugar that comes with eating starchy foods. Sugar spikes can be dangerous for diabetics who lack the insulin to handle it and have been linked to cancer, heart disease and other conditions.

Although potatoes provide valuable carbohydrates and vitamins with minimal fat, most varieties have a high glycemic index, which means they are rapidly digested and boost blood sugar dangerously fast. MSU currently has six varieties that have a lower glycemic index than russet Burbank or Yukon Gold potatoes, which are rated high on the glycemic index.

That means diabetics and others watching their carbohydrate intake can have their potatoes and eat them, too.

"We want to let people know that if they have to watch their GI there are potatoes out there they can eat," said Alice Pilgeram, an assistant research professor. "We are hoping that this will create more demand for these potatoes, and seed producers will grow more, turning it into a nice specialty market for the Montana seed producers."

The timing couldn't be better. According to the American Diabetes Association, 23.6 million adults and children, or 7.8 percent of the population of the United States, have diabetes. The Centers for Disease Control and Prevention estimates that one in three adults may develop diabetes by 2050 if current trends continue.

The research was funded in part by a three-year, $154,000 Western Sustainable Agriculture Research & Education grant the Sands' Lab received in 2012. The SARE program is administered by the U.S. Department of Agriculture to advance sustainable, profitable and environmentally sound farm and ranch systems. That same year the lab also received a $50,000 grant from the Montana Department of Agriculture Specialty Crop Block Grant Program.

Varieties of potato with low GI are commercially available in niche markets in Europe and Australia, but not in the United States. So researchers screened the starch profiles of over 110 varieties of U.S. potatoes, evaluating the agronomic performance of the most promising 10, eventually whittling that number down to six.

The potatoes are not genetically modified. Rather, researchers analyzed existing varieties and used traditional breeding methods to select for desirable traits.

Those six were then planted in experimental field plots in Williston, N.D., and Parma, Idaho, during the 2015 growing season. The lines will be further increased this winter at California Polytechnic University Pomona and test marketed.

"These plants already exist in the old seed banks," Pilgeram said. "Breeders overlooked their attributes because they were looking for yield and pest resistance."

The subtext of the potato research has to do with the trade-offs inherent in modern plant breeding, which has historically put high agronomic yield, easy and consistent processing, and disease and pest resistance before nutrition, said Montana State University Professor of Plant Pathology David Sands.

"Every crop should be as nutritious as

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Table 1. Agronomic evaluation of 49 entries tested in the Intrastate Spring Barley Performance Trial conducted at Huntley under dryland conditions in 2015. MSU Southern Agricultural Research Center. Exp 210815.

Cultivar	Pedigree	Grain Yield[1/] 2015	2014-15	2013-15	Test Weight	Grain Moisture	Grain[2/] Protein	Plump Kernels	Thin Kernels	Plant Height	Heading Date Julian	Heading Date Calendar	Maturity Date Julian	Maturity Date Calendar
		bushels/acre			lb/bu	%	%	%	%	inches				
MT124001	MT010158/MT070175	91.0			52.6	12.8	13.4	97.1	0.9	35.9	163.0	Jun 12	195.5	Jul 14
MT124007	MT010158/MT070175	80.3			52.1	11.3	11.6	98.0	0.9	35.7	163.0	Jun 12	192.3	Jul 11
MT124008	MT010158/MT070175	85.6			51.9	12.7	11.8	96.8	1.2	34.2	164.3	Jun 13	196.8	Jul 15
MT124015	MT010158/MT070175	84.0			51.8	11.0	10.7	96.9	0.9	34.0	163.0	Jun 12	190.6	Jul 9
MT124016	MT010158/MT070175	86.9			52.0	11.2	9.7	96.9	0.9	30.3	165.0	Jun 14	190.3	Jul 9
MT124018	MT010158/MT070175	80.3			52.4	11.3	11.5	97.0	0.9	32.5	161.3	Jun 10	191.3	Jul 10
MT124025	MT010158/MT070175	90.8	86.3		52.4	12.7	11.7	96.7	1.2	34.6	164.3	Jun 13	193.9	Jul 12
MT124026	MT010158/MT070175	84.9	84.0		52.5	11.4	10.7	97.2	0.9	34.6	163.0	Jun 12	191.8	Jul 10
MT124069	MT010158/MT070175	90.2			52.1	10.9	10.5	96.4	1.5	34.9	164.0	Jun 13	191.4	Jul 10
MT124071	MT010158/MT070175	76.3			50.6	11.4	10.1	95.4	1.5	30.9	161.7	Jun 10	193.5	Jul 12
MT124073	MT010158/MT070175	**98.8***			52.1	10.9	11.1	95.8	1.2	37.0	163.0	Jun 12	192.3	Jul 11
MT124112	Hockett/MT070174	81.2			52.2	12.0	9.9	98.5	0.6	31.9	160.3	Jun 9	194.6	Jul 13
MT124113	Hockett/MT070174	53.5			51.8	13.2	10.6	97.8	0.6	32.4	159.0	Jun 8	196.5	Jul 15
MT124118	Hockett/MT070174	94.0			52.1	11.6	12.2	97.6	0.9	34.3	161.3	Jun 10	192.0	Jul 11
MT124127	Hockett/MT070174	77.8			53.2	11.7	11.8	97.9	0.6	33.7	161.7	Jun 10	189.9	Jul 8
MT124128	Hockett/MT070174	54.1			53.0	12.6	10.5	98.8	0.3	31.2	159.3	Jun 8	192.6	Jul 11
MT124134	Hockett/MT070174	51.4			53.0	12.0	10.2	98.8	0.6	32.5	159.0	Jun 8	195.0	Jul 14
MT124148	Craft/MT070174	95.0			53.0	11.6	10.4	94.7	1.5	32.9	164.7	Jun 13	193.4	Jul 12
MT124361	MT020204/MT070175	89.5			53.6	11.5	12.6	97.4	0.9	34.4	161.7	Jun 10	191.3	Jul 10
MT124370	MT020204/MT070175	89.1			53.0	11.4	10.1	96.4	1.2	29.8	164.3	Jun 13	194.0	Jul 13
MT124380	MT020204/MT070175	85.8			52.7	10.8	10.0	95.1	1.8	30.7	161.0	Jun 10	191.6	Jul 10
MT124454	MT010158/MT070176	82.3			53.4	10.7	11.2	98.0	0.6	31.8	162.0	Jun 11	190.7	Jul 9
MT124457	MT010158/MT070176	82.3			52.7	11.4	11.3	98.2	0.9	33.8	161.7	Jun 10	191.4	Jul 10
MT124555	MT040073/MT040075	**108.9****			54.2	11.1	12.1	97.2	0.9	36.5	163.0	Jun 12	193.2	Jul 12
MT124601	MT020204/MT070175	85.2			53.4	12.3	10.8	94.7	2.1	36.2	163.0	Jun 12	197.3	Jul 16
MT124645	MT010158/MT070176	81.8			52.1	11.9	10.0	95.8	1.5	35.9	163.7	Jun 12	196.4	Jul 15
MT124663	Hockett/MT070174	69.0			51.4	12.8	10.2	97.8	0.6	31.3	160.7	Jun 9	195.5	Jul 14
MT124673	Hockett/MT070174	80.6			52.4	14.6	11.8	97.0	0.9	32.2	161.3	Jun 10	197.5	Jul 16
MT124677	Hockett/MT070174	72.2			52.7	11.7	9.8	97.6	0.9	28.5	160.3	Jun 9	196.3	Jul 15
MT124716	MT010158/MT070175	78.8			52.2	11.2	12.6	96.8	1.2	30.7	163.0	Jun 12	190.1	Jul 9
MT124728	MT010158/MT070175	57.4	73.9		51.9	11.8	10.4	95.3	1.2	27.6	163.7	Jun 12	190.9	Jul 9
MT124027	MT010158/MT070175	86.6	83.9		51.3	10.7	10.7	94.1	1.9	33.2	162.7	Jun 11	190.5	Jul 9
Champion	Baronesse/Camas	90.3	89.4	**87.5****	53.9	11.1	11.0	96.0	1.1	34.2	162.0	Jun 11	191.0	Jul 10
Craft	Klages/Baronesse	74.9	76.9	75.2	52.7	10.9	10.0	97.0	0.9	33.4	161.7	Jun 10	192.1	Jul 11
Merit	Manley//S74234/Summit	78.5			51.3	11.1	11.1	97.0	0.9	31.4	163.0	Jun 12	191.6	Jul 10
Harrington	Klages/Gazelle/Betzes/Centennial	78.1	76.8	74.8	52.3	11.0	12.9	96.0	0.9	34.2	163.0	Jun 12	191.7	Jul 10
Haxby	Gallatin/Bellona//Clark/Lamont	88.4	87.1	**83.6***	53.1	11.0	9.5	95.3	0.9	32.9	161.3	Jun 10	189.0	Jul 8
Haybet	Betzes*7/Strip Tease	62.7			49.7	11.0	11.8	74.7	6.3	39.0	161.3	Jun 10	189.1	Jul 8
Hockett	ND7593/Bearpaw	88.5	84.8	80.2	54.0	11.1	10.6	98.5	0.6	33.1	162.0	Jun 11	189.9	Jul 8
Lavina	Haybet/Baronesse	87.8			49.2	10.9	11.8	78.5	8.3	34.3	162.7	Jun 11	189.9	Jul 8
Conrad	B1215/2B88-5336	87.0	80.4	76.7	52.1	12.7	12.8	96.1	1.5	32.5	163.7	Jun 12	192.6	Jul 11
Stockford	Baronesse/BZ591-57	77.2			50.5	10.9	10.5	96.2	1.3	36.9	161.7	Jun 10	194.3	Jul 13
AC Metcalfe	AC Oxbow/Manley	93.7	85.0		52.9	11.0	11.9	96.9	0.9	35.4	162.3	Jun 11	192.0	Jul 11
Moravian 115		93.0			50.1	10.7	12.8	94.5	1.9	25.8	166.7	Jun 15	195.0	Jul 14
09/668/24		94.2			52.4	11.4	11.9	96.4	1.2	29.5	164.3	Jun 13	196.0	Jul 15
08032-156		90.1			51.2	11.3	10.5	96.9	0.9	26.9	165.3	Jun 14	190.2	Jul 9
08042-077		87.1			52.0	10.8	10.8	97.2	0.9	35.3	163.7	Jun 12	193.0	Jul 12
08053-050		90.8			51.8	11.6	11.3	97.9	0.9	32.5	163.7	Jun 12	190.3	Jul 9
07030-034		86.1	85.7		52.1	11.5	11.3	97.8	0.9	32.8	165.0	Jun 14	189.7	Jul 8
Average		82.7	82.8	79.7	52.2	11.6	11.1	96.0	1.3	33.0	162.6	Jun 12	192.6	Jul 11
PLSD (0.05)		12.0	ns	6.2	1.6	1.2	1.2	3.0	1.2	2.5	10.6	-	3.4	-
CV%		8.4	16.0	7.4	1.9	6.6	6.0	1.9	57.8	4.4	4.0	-	1.0	-
Lattice RE% [/3]		144	-	-	101	100	166	101	102	122	100	-	109	-

1/ Grain yields are based on a 48 pound per bushel standard bushel weight and adjusted to 13% grain moisture content.

2/ Grain protein values adjusted to a 100 dry matter content.

3/ Adjusted means provided for Lattice RE% values equal to or greater than 105%.

** denotes highest yielding entry within a column.

* denotes entries yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

ns denotes no difference between entries within a column based on Fisher's Protected LSD at the 0.05 probability level.

Planting Date: April 2, 2015

Harvest Date: July 21, 2015

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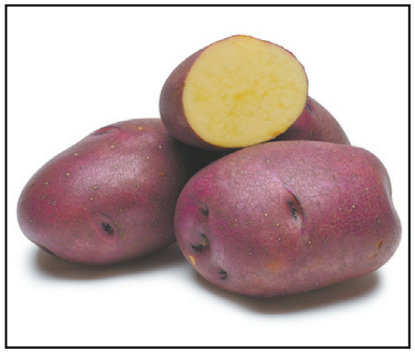
possible," Sands said. "Too often, agriculture has been driven by interest in farmer profit and with good reason. But we think if you please the consumer with these high nutrition items, the farmer will take care of herself very well."

In other words, building the market demand for low GI crops like the potatoes, but also low GI field peas and durum wheat developed in MSU labs, goes hand in hand with building the production of them.



The Huckleberry Gold, a low-GI potato released by the Tri-State Potato Commission, is a nutritious variety that produces round to oval tubers with purple skin and yellow flesh.

"They have to ratchet up together," Sands said.

One way to build market demand is by collaborating with diabetic support groups, similar to a past collaboration MSU researchers had with the American Celiac Society to bolster Montana-produced, gluten-free crops and products.

Another way is to focus on the garden seed market, natural markets, farmers markets and health markets.

To meet that demand, MSU researchers plan to work with the Montana seed potato industry to scale-up seed potato production in Montana and the Northwest. Montana has a well-regarded seed potato industry that supplies certified seed potatoes to commercial potato producers across the country.

Only cultivars that have been certified virus- and bacterial-free by the MSU Seed Potato Lab can be planted in Montana. Of the 110 cultivars screened by MSU, one of the six lowest GI cultivars, Huckleberry Gold, has already been released by the Potato Lab and is in production by four Montana certified seed suppliers. Certification of the other five cultivars is in progress.

Huckleberry Gold, released by the Tri-State Potato Commission, is a nutritious variety that produces round to oval tubers more resistant to growth cracks, secondary growth and hollow heart than Yukon Gold and with high antioxidant concentrations and good resistance to common scab and Verticillium wilt.

"It's a beautiful potato with purple skin and yellow flesh," Pilgeram said.

The other lines are working their way through the Montana seed potato certification system. This certification requires several generations and the lines will not be ready for release to growers for at least two seasons. The lines are being increased on a non-certified basis for market testing at California Polytechnic University Pomona. Limited quantities of these tubers will be made available to gardeners throughout the Northwest (but not Montana).

Huckleberry seed is available from Montana Seed Potato (http://www.-mtseedpotato.org/), which sells 50 pound boxes of seed potato to plant nurseries and county extension. Interested growers should contact their local nursery or county extension to ask them to order the Huckleberry Gold seed potato. ★

Table 2. Agronomic evaluation of 49 entries tested in the Intrastate Spring Barley Performance Trial conducted at Huntley under irrigated conditions in 2015. MSU Southern Agricultural Research Center. Exp 220915.

		Grain Yield[1/]			Test	Grain	Grain[2/]	Plump	Thin	Plant	Heading Date		Maturity Date	
Cultivar	Pedigree	2015	2014-15	2013-15	Weight	Moisture	Protein	Kernels	Kernels	Height	Julian	Calendar	Julian	Calendar
		---------- bushels/acre ----------			lb/bu	%	%	%	%	inches				
MT124001	MT010158/MT070175	89.8			51.7	14.5	10.4	97.9	0.6	36.3	161.7	Jun 10	195.1	Jul 14
MT124007	MT010158/MT070175	98.4			52.7	13.3	10.5	97.3	0.9	39.1	161.7	Jun 10	195.2	Jul 14
MT124008	MT010158/MT070175	92.8			51.4	14.5	10.7	96.3	1.2	36.9	162.0	Jun 11	193.6	Jul 12
MT124015	MT010158/MT070175	**109.5***			52.3	11.5	10.6	96.8	0.9	39.0	162.3	Jun 11	190.6	Jul 9
MT124016	MT010158/MT070175	**114.8***			51.6	11.8	10.7	96.8	1.0	36.4	162.0	Jun 11	192.5	Jul 11
MT124018	MT010158/MT070175	87.7			51.3	12.3	11.3	97.2	1.0	36.8	160.7	Jun 9	190.3	Jul 9
MT124025	MT010158/MT070175	100.2			51.3	14.6	9.7	97.5	0.9	37.1	162.3	Jun 11	194.8	Jul 13
MT124026	MT010158/MT070175	93.6			51.6	14.2	9.9	97.8	0.9	38.3	185.7	Jul 4	194.0	Jul 13
MT124069	MT010158/MT070175	101.7			51.2	12.2	9.6	96.0	1.8	39.2	163.0	Jun 12	193.2	Jul 12
MT124071	MT010158/MT070175	108.5			51.0	12.3	11.0	96.6	1.3	36.9	161.0	Jun 10	196.6	Jul 15
MT124073	MT010158/MT070175	**109.5***			51.9	12.1	10.0	95.8	1.5	41.4	162.3	Jun 11	190.5	Jul 9
MT124112	Hockett/MT070174	104.9			52.7	12.4	10.8	98.3	0.9	35.7	160.3	Jun 9	196.8	Jul 15
MT124113	Hockett/MT070174	90.9			52.0	14.2	11.9	97.0	0.9	38.0	160.3	Jun 9	195.6	Jul 14
MT124118	Hockett/MT070174	106.8			53.7	11.7	9.9	98.1	0.6	36.7	162.0	Jun 11	190.4	Jul 9
MT124127	Hockett/MT070174	98.5			54.3	11.5	11.7	99.1	0.0	35.1	161.7	Jun 10	189.9	Jul 8
MT124128	Hockett/MT070174	89.6			53.6	12.7	11.6	98.8	0.3	37.0	159.0	Jun 8	193.0	Jul 12
MT124134	Hockett/MT070174	85.8			53.4	12.8	11.7	98.5	0.6	36.9	159.0	Jun 8	194.7	Jul 13
MT124148	Craft/MT070174	**119.7****			53.3	12.6	10.7	93.4	2.1	37.6	161.7	Jun 10	198.1	Jul 17
MT124361	MT020204/MT070175	92.8			53.1	11.8	11.1	97.5	0.9	40.4	160.3	Jun 9	191.9	Jul 10
MT124370	MT020204/MT070175	**117.0***			53.1	12.2	10.5	95.8	1.8	35.0	162.3	Jun 11	193.0	Jul 12
MT124380	MT020204/MT070175	100.8			52.6	12.1	10.0	96.3	1.2	33.6	161.7	Jun 10	190.9	Jul 9
MT124454	MT010158/MT070176	104.7			53.9	11.6	10.3	98.2	0.9	39.2	160.3	Jun 9	190.3	Jul 9
MT124457	MT010158/MT070176	107.6			54.0	11.6	11.2	97.9	0.9	37.7	160.0	Jun 9	190.4	Jul 9
MT124555	MT040073/MT040075	**110.0***			53.8	11.9	9.9	96.8	1.2	37.1	162.3	Jun 11	190.6	Jul 9
MT124601	MT020204/MT070175	86.3			51.8	15.7	9.1	95.4	1.8	36.6	166.0	Jun 15	200.8	Jul 19
MT124645	MT010158/MT070176	102.4			52.9	11.4	9.9	99.1	0.0	37.4	160.7	Jun 9	189.7	Jul 8
MT124663	Hockett/MT070174	99.8			51.7	14.0	11.6	98.2	0.9	37.6	160.0	Jun 9	198.4	Jul 17
MT124673	Hockett/MT070174	88.4			53.2	12.6	10.8	98.3	0.6	39.3	160.0	Jun 9	191.4	Jul 10
MT124677	Hockett/MT070174	98.0			53.3	13.4	11.2	97.9	0.9	33.1	161.3	Jun 10	198.4	Jul 17
MT124716	MT010158/MT070175	100.3			52.2	11.8	11.2	97.2	0.6	36.9	162.3	Jun 11	192.7	Jul 11
MT124728	MT010158/MT070175	103.9			51.9	12.2	12.1	97.2	0.6	35.5	162.0	Jun 11	192.7	Jul 11
MT124027	MT010158/MT070175	106.3			51.9	12.3	9.4	97.5	0.6	38.5	162.0	Jun 11	191.9	Jul 10
Champion	Baronesse/Camas	**110.3***			53.2	12.1	11.1	96.1	0.9	40.3	161.3	Jun 10	194.7	Jul 13
Craft	Klages/Baronesse	**114.2***			53.6	11.8	12.1	95.7	1.8	41.5	166.0	Jun 15	193.2	Jul 12
Merit	Manley//S74234/Summit	107.5			50.5	12.4	12.4	91.4	3.2	37.4	215.7	Aug 3	195.8	Jul 14
Harrington	Klages/Gazelle/Betzes/Centennial	85.9			51.5	12.7	11.3	93.5	2.2	36.5	162.7	Jun 11	195.7	Jul 14
Haxby	Gallatin/Bellona//Clark/Lamont	**110.3***			54.4	11.6	10.6	96.5	1.2	36.7	161.0	Jun 10	190.0	Jul 9
Haybet	Betzes*7/Strip Tease	75.6			46.7	11.5	13.9	55.2	17.8	41.3	161.0	Jun 10	189.7	Jul 8
Hockett	ND7593/Bearpaw	105.0			53.7	11.8	11.2	97.9	0.9	35.9	162.0	Jun 11	191.0	Jul 10
Lavina	Haybet/Baronesse	103.0			47.7	11.7	11.6	77.8	9.6	40.3	161.7	Jun 10	191.5	Jul 10
Conrad	B1215/2B88-5336	102.4			51.7	13.9	11.4	96.3	1.5	37.5	163.3	Jun 12	194.8	Jul 13
Stockford	Baronesse/BZ591-57	92.9			48.7	11.8	11.8	94.1	1.7	41.7	161.7	Jun 10	195.3	Jul 14
AC Metcalfe	AC Oxbow/Manley	102.8			52.6	11.7	10.8	96.1	1.5	39.5	162.3	Jun 11	190.0	Jul 9
Moravian 115		97.6			48.9	13.4	9.4	93.2	2.7	28.0	163.7	Jun 12	199.1	Jul 18
09/668/24		99.9			51.8	13.1	9.5	97.2	1.2	29.4	163.0	Jun 12	199.5	Jul 18
08032-156		**119.2***			50.5	11.4	10.8	97.0	1.3	30.5	161.7	Jun 10	194.4	Jul 13
08042-077		92.9			51.0	14.5	10.5	97.1	1.3	39.8	162.0	Jun 11	194.1	Jul 13
08053-050		106.0			51.0	11.1	10.6	98.2	0.6	35.4	161.0	Jun 10	190.4	Jul 9
07030-034		106.2			51.1	11.3	11.0	96.3	1.2	37.2	162.7	Jun 11	189.7	Jul 8
Average		101.1			52.0	12.5	10.8	95.6	1.7	37.2	163.3	Jun 12	193.4	Jul 12
PLSD (0.05)		10.9			0.8	1.0	0.8	2.8	1.6	3.6	ns	-	3.7	-
CV%		6.3			0.9	4.9	4.5	1.8	61.0	5.9	9.0	-	1.1	-
Lattice RE%[3/]		117.3			104.4	100.4	126.8	97.4	97.5	97.4	100.0	-	105.6	-

1/ Grain yields are based on a 48 pound per bushel standard bushel weight and adjusted to 13% grain moisture content.

2/ Grain protein values adjusted to a 100 percent dry matter content.

3/ Adjusted means provided for Lattice RE% values equal to or greater than 105%.

** denotes highest yielding entry within a column.

* denotes entries yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

ns denotes no difference between entries within a column based on Fisher's Protected LSD at the 0.05 probability level.

Planting Date: March 30, 2015

Harvest Date: July 24, 2015