

SPARTAN PEARL: A WIDELY ADAPTED, HIGH YIELDING WHITE SKIN POTATO CULTIVAR

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Abstract

Spartan Pearl (MS700-83) is a round white potato selected from a cross between Atlantic and Michibonne (MS709) in 1978. It has smooth, round white uniformly sized tubers. The skin has a light netting and shallow eyes that are well distributed on the tuber. Spartan Pearl produces yields comparable to Atlantic with medium specific gravity and has a maturity slightly earlier than Norchip. It has good fresh market potential, chips out of field, and is suited for short-term chip storage at 50 F. It has minimal internal defects and its internal quality is superior to Atlantic. A transcript of an electrophoretic fingerprint is provided to assist in cultivar identification.

Compendio

Spartan Pearl (MS700-83) es una papa blanca y redonda seleccionada de una cruce realizada entre Atlantic y Michibonne (MS709) en 1978. Tiene tubérculos lisos, redondos y blancos de tamaño uniforme. La piel es ligeramente rugosa y los ojos poco profundos están bien distribuidos en el tubérculo. Spartan Pearl produce rendimientos comparables a Atlantic con gravedad específica media. Tiene madurez ligeramente más temprana que Norchip. Tiene buen potencial para mercado fresco, puede ser frito en hojuelas directamente del campo, o después de almacenamiento corto a 10°C. Tiene un mínimo de defectos internos y su calidad interna es superior a la de Atlantic. Se presenta una caracterización electroforética para facilitar la identificación del cultivar.

Introduction and Pedigree

Spartan Pearl is a round white potato which has primary use in the fresh market. Although it does produce an acceptable chip color, the specific gravity may be below the level desired by the chip industry in some locations.

Spartan Pearl was bred at Michigan State University (MSU) in the Department of Crop and Soil Sciences and was selected from a cross between

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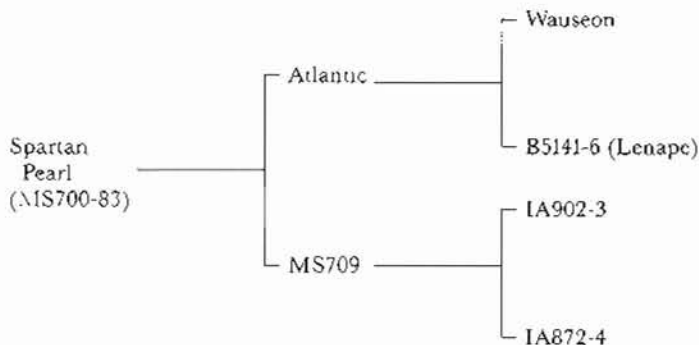
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ADDITIONAL KEY WORDS: *Solanum tuberosum*, fresh market, Atlantic.

Atlantic and MS709 in 1978. The name Spartan refers to the mascot for MSU. The clone was tested as MS700-83 and was selected for its consistent high yields of uniformly sized tubers and excellent internal quality.

It was initially evaluated at the MSU Montcalm Research Farm, then tested for three years in the North Central Regional Trials where it received high merit ratings.

The pedigree of Spartan Pearl is as follows:



Description

PLANTS

Maturity. main season, *Growth habit:* medium size, spreading vine. *Stems:* green (5 GY 6/2),³ non-pigmented, nodes slightly swollen, wings small to moderate in size in the mainstems but inconspicuous on branches. *Leaves:* green (7.5 GY 5/4), non-pigmented, short pubescence consisting of single- and multi-celled hairs and leaf margins entire. Petiole with sparse pubescence, midrib yellow-green with short pubescence, stipule non-pigmented with pubescence only on the lower surface. *Terminal leaflets:* asymmetrical, cuspidate apex, cordate base, index of width to length 0.65. *Primary leaflets:* usually three pairs, lobed asymmetrically at base, cuspidate tip, index of width to length 0.52. *Secondary leaflets:* 3-5 pairs and tertiary leaflets are few.

Flowers: abundant, inflorescence branched, usually carried above the foliage with a long peduncle. Peduncle and pedicel non-pigmented with a moderate amount of short pubescence. *Buds:* light green and non-pigmented. *Calyx:* sepals light green, acuminate, 6-8 mm long and pubescent. *Corolla:* rotate petals, white and medium in size. *Stamens:* anther yellow (5 Y 8/12) and 7-8 mm long. *Pistil:* green throughout with dark green stigma, length longer than stamens. Both male and female fertility is high.

³Munsell[®] Color Charts for Plant Tissues. Second Edition (revised 1977).

TUBERS

Uniformly sized round to blocky with a light skin netting similar to Atlantic (Figure 1). The length to width ratio is 0.94; length to depth 1.01; width to depth 1.08 (based upon 50 tubers). Eyes are medium to shallow and well distributed. Flesh is white, dormancy is medium and maturity is medium-late (110-120 days). The total glycoalkaloid content of tubers out of the field in 1990 is 7.1 mg/100 gr. fresh weight compared with Russet Burbank and Atlantic at 5.9 and 6.2 mg/100 gm, respectively.

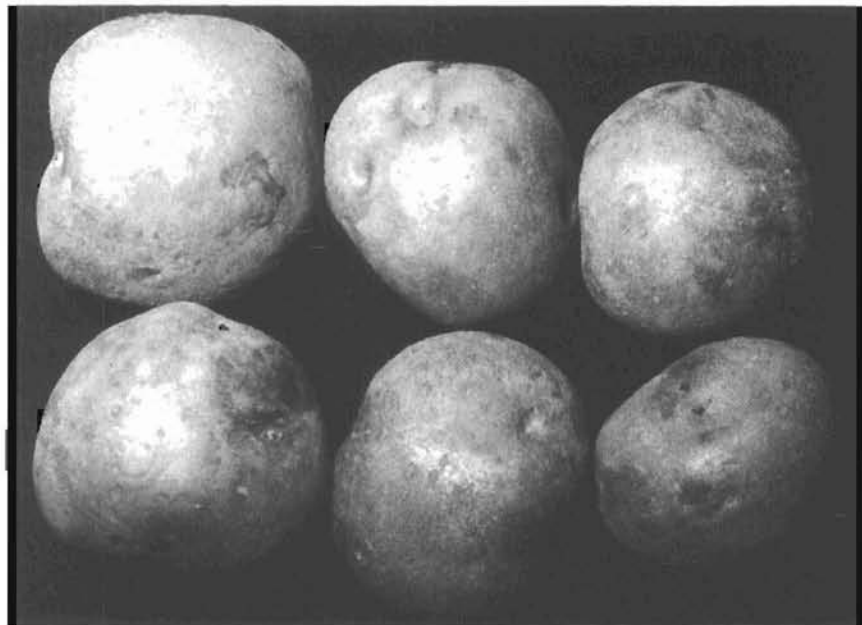


FIG. 1. Tuber sample of Spartan Pearl

Characteristics

Spartan Pearl was tested intensively in Michigan, the North Central Regional Trials in 1985-87 and the Snack Food Association Chip Trials in seven states in 1988-90. In the dates-of-harvest studies at the MSU Montcalm Research Farm, marketable yields have been slightly higher than Atlantic at both 110-120 and 130-140 days after planting (Table 1). Compared with Monona and Superior at 110-120 days, the U.S. No. 1 yields have been 31% and 47% higher, respectively. Yields have been slightly less than Onaway, an earlier maturing, fresh-market potato in Michigan. The average specific gravity in Michigan under irrigated conditions is 1.077 which is lower than Atlantic but higher than Monona, Onaway and Superior.

Spartan Pearl was tested in the North Central Regional Trials in 1985-87 (Table 2). Compared with Norchip, the yield of Spartan Pearl was 12% higher and specific gravity was 0.003 units lower. Incidence of common scab and growth cracks were observed at some locations.

TABLE 1.—Performance of Spartan Pearl compared with four other cultivars at two dates-of-harvest at the MSU Montcalm Research Farm.

	Years Tested	110-120 Days			130-140 Days			
		Yield (T/ha)		%	Yield (T/ha)		%	
		Total	U.S. No. 1	U.S. No. 1 Gravity	Total	U.S. No. 1	U.S. No. 1 Gravity	
Atlantic	10	53.4a ¹	48.2a	90	53.1a	48.4a	91	1.088a
Monona	4	41.2b	38.0b	91	43.7b	40.1b	92	1.070c
Onaway	10	56.5a	51.3a	91	56.3a	51.6a	91	1.067c
Spartan Pearl	7	56.7a	50.1a	88	56.3a	49.9a	89	1.075b
Superior	4	36.9b	34.0c	92	38.5b	34.1b	88	1.073b

¹Means with same letter are not significantly different at the 5% level.

TABLE 2.—The performance of Spartan Pearl compared with Norchip in the North Central Regional Trials (1985-87).

	Yield (T/ha) ¹		% U.S. No. 1	Mat. ²	Specific Gravity
	Total	U.S. No. 1			
1987					
Spartan Pearl	43.3	36.7	84	3.3	1.070
Norchip	41.8	32.9	85	3.6	1.075
1986					
Spartan Pearl	39.2	30.5	77	2.8	1.075
Norchip	36.7	28.2	77	2.9	1.076
1985					
Spartan Pearl	42.9	36.5	83	2.7	1.073
Norchip	37.7	30.7	79	3.0	1.076
3 Year Average					
Spartan Pearl	41.8	34.6	83	2.9	1.073
Norchip	38.7	30.6	79	3.2	1.076

¹No significant differences were observed at the 5% level.

²Maturity ratings 1 = very early, 5 = very late.

In 1988-90, Spartan Pearl was one of the entries in the Snack Food Association Chip Trial conducted in seven regional locations; California, Florida, Maine, Pennsylvania, Michigan, Red River Valley and Washington. During the three years of testing, U.S. No. 1 yield of Spartan Pearl was 2% lower than Atlantic but 20% higher than Norchip (Table 3). Specific gravity was lower than both Atlantic and Norchip. Table 4 details the chip-processing ability of Spartan Pearl.

Spartan Pearl emerges quickly and produces a vigorous stand. It has a high yield potential of uniformly sized, attractive tubers with minimal internal defects. It is susceptible to common scab and has some tendency to form growth cracks under adverse conditions. The tubers have shown some tendency for after-cooking darkening. The tubers have a medium to short dormancy and would require a sprout inhibitor for long-term storage. When stored at less than optimum conditions of relative humidity and temperature, Spartan Pearl has shown some pressure-bruise damage.

Production Management

In a two-year study of three plant spacings (15.2, 22.9 and 30.5 cm) and three nitrogen levels (112, 168 and 224 kg/ha), no significant differences

TABLE 3.—*The performance of Spartan Pearl compared with Atlantic and Norchip in the Snack Food Association Chip Trials between 1988 and 1990 averaged over seven locations.*

Variety	Yield (T/ha) ¹			Specific Gravity
	Total	U.S. No. 1	% U.S. No. 1	
1990				
Spartan Pearl	36.0	31.3	87	1.080b
Atlantic	41.0	36.4	89	1.091a
Norchip	33.6	27.5	82	1.081b
1989				
Spartan Pearl	32.7a	27.0a	81	1.072c
Atlantic	29.8a	23.7a	78	1.085a
Norchip	23.3b	18.3b	75	1.078b
1988				
Spartan Pearl	32.1	26.9	85	1.076b
Atlantic	31.8	27.1	86	1.087a
Norchip	30.4	24.9	83	1.079b
3 Year Average				
Spartan Pearl	33.9	28.4	84	1.076b
Atlantic	34.2	29.1	85	1.086a
Norchip	29.1	23.6	81	1.079b

¹Means followed by the same letter are not significantly different at 5% level.

in the US No. 1 yield was observed between the spacings and nitrogen levels (Table 5). Also, the spacing and nitrogen interaction effects were not significant.

TABLE 4.—Chip color of potato cultivars in the 1988 and 1990 Snack Food Association trials conducted in Essexville, MI.

Cultivar	Out of Field	1989				
		Agron values ¹		Days Reconditioned ²		
		Days stored at 10°C	130	0	10	20
Atlantic	69 ³	64	68	57	54	66
Norchip	60	60	58	45	50	50
Spartan Pearl	66	65	63	31	44	48
1988						
Atlantic	74	61	70	43	47	56
Norchip	73	69	59	40	39	56
Spartan Pearl	76	66	70	39	41	53

¹Agron E-10 colorimeter.

²Stored 130 days at 7.8 C, reconditioning temperature increased gradually from 7.8 C to 18 C, raising 1 C each day and eventually maintained at 18 C.

³Chip scores based upon 20 grade A tuber sample bulked over 4 replications. A chip score greater than 55 is acceptable color, while a reading greater than 60 indicates excellent chip color.

TABLE 5.—Nitrogen and spacing effects on Spartan Pearl (1986-87).

Treatment	Spacing (cm)	Yield (T/ha)		Percent Distribution				Specific Gravity	
		U.S. No.1	Total	U.S. No.1	<5 cm	5-8.3 cm	>8.3 cm		
Nitrogen Effects									
	112	46.4	53.5	87	12	81	5	1	1.078
	168	49.3	56.8	87	13	78	8	1	1.077
	224	49.1	57.3	86	12	76	8	1	1.077
Spacing Effects									
	15.2	48.7	57.5	85	15	79	5	1	1.077
	22.9	47.8	55.3	86	13	78	8	1	1.078
	30.5	48.4	54.7	88	10	79	8	1	1.077

Reaction to Diseases and Disorders

Based upon field observations, Spartan Pearl has moderate tolerance to early blight, mosaic viruses and PLRV. In field and greenhouse tests conducted by Dr. Ray Hammerschmidt, Spartan Pearl was rated as sus-

ceptible to common scab, *Streptomyces scabies*. In field tests conducted by Dr. Mel Lacy, Spartan Pearl has exhibited the typical foliar and tuber symptoms of bacterial ring rot, caused by *Corynebacterium sepedonicum*. In laboratory tests, the tubers were susceptible to bacterial soft rot *Erwinia caratovora* var. *caratovora* and dry rot *Fusarium sambucinum*. Growth cracks and black scurf have been reported in some fields. Harvesting under cold conditions have produced tuber cracks. It has moderate resistance to blackspot.

Electrophoretic Fingerprint

Both tuber and leaf tissue were sampled from Spartan Pearl to construct an electrophoretic fingerprint. The procedures and allelic designations used are according to Douches and Ludlam (1). The transcript for thirteen enzyme loci are described below:

*Mdh-1*²*1*²*1*²*1*⁴, *Mdh-2*²*2*²*2*²*3*³, *6-Pgdh-3*¹*3*¹*3*¹*3*², *Idh-1*¹*1*¹*1*¹*2*²,
*Pgi-1*²*1*²*1*²*1*², *Aps-1*¹*1*¹*1*¹*1*¹, *Got-1*¹*1*¹*1*¹*1*¹, *Got-2*³*2*⁵*2*⁵*2*⁵,
*Pgm-1*¹*1*¹*1*³*1*³, *Pgm-2*²*2*²*2*²*2*³, *Dia-1*¹*1*¹*1*¹*1*¹, *Prx-3*¹*3*³*3*³*3*³,
*Adh-1*²*1*²*1*²*1*².

This electrophoretic data is maintained as part of a database with about 120 other North American Potato varieties at Michigan State University (1). This fingerprint is unique to Spartan Pearl.

Acknowledgments

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