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'Chase' Pinto Dry Bean

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The release of 'Chase' fulfills a need in southwestern Nebraska for a Pinto dry bean cultivar *(Phaseolus vulgaris* L.) with resistance to rust *[Uromyces appendiculatus* (Pers.) Unger] and several bacterial diseases. Rust, common bacterial blight *[Xanthomonas campestris* pv. *phaseoli* (Smith) Dye], and bacterial brown spot *(Pseudomonas syringae* pv. *syringae* van Hall) diseases have recently reduced bean yields and seed quality of Pinto dry beans in that region and northeastern Colorado. 'Chase' is the first Pinto cultivar that combines resistance to rust(races of rust prevalent in recent years in Nebraska and Colorado), bacterial brown spot, halo blight [P. *syringae* pv. *phaseolicola* (Burkholder)], moderate resistance to common blight, and moderate avoidance of white mold *[Sclerotinia sclerotiorum* (Lib.) de Bary] due to a porous canopy. 'Chase' also has resistance to potato leafhopper "bum" injury caused *by Empoasca fabae* Harris.

Origin

We deemed it important to develop an early maturing Pinto line with resistance to rust and common blight and with moderate avoidance to white mold. 'Chase' (evaluated as PWM_2-89-5 from 1989 to 1992) was derived by pedigree selection (Fig. 1) from a cross of a Nebraska (NE) Great Northern (GN) breeding line GN WM_2-84- 17 (upright plant habit, moderately early, resistant to common bacterial blight and rust, and moderate avoidance of white mold) and a NE Pinto (P) breeding line PWM_2-84-45 (prostrate habit, early maturity, good Pinto seed size and shape, rust-resistant, but susceptible to white mold and common blight). These lines were derived from intercrosses of P and GN lines that were derived from pedigree selection from crosses of GN Nebraska #1 selection 27 (late-maturing, Type III plant habit, and resistant to common blight) (Coyne and Schuster, 1983) × 'Tacaragua' (Venezuela) (black seed, Type IIb plant habit, late maturity, resistant to rust races in Nebraska, and moderate avoidance of white mold) and F_2BC_6GN Nebraska#l selection 27× Pinto 'UI-111' (early maturity; Type III plant habit; susceptible to rust, common blight, and white mold Fig. 1). We used the classification scheme reportedly Singh (1982) to describe growth habits of common beans. The cross GN Nebraska #1 selection 27 × 'Tacaragua' was made by Valladares-Sanchez et al. (1983) to study the inheritance of resistance to common bacterial blight.

Description

Annual recurrent selections for disease resistances were made in separate inoculated common blight and rust nurseries at North Platte, Neb., and a natural white mold nursery at Mitchell, Neb. Yield trials were located at several sites in Nebraska and Colorado (Tables 1 and 2). All trials were grown under irrigated conditions using standard, region-specific cultural practices. 'Chase', along with standard cultivars Pinto UI- 114 and Othello, were included in the tests. Disease ratings of entries were recorded in the inoculated and in any naturally infected nurseries (Table 1). Yields (Table 2) (except in the rust- and common-blight-inoculated nurseries at North Platte), days to maturity,seed weights,seedcoat cracking, and duration of cooking required to reach tenderness were also recorded.

'Chase'was resistant to rust in Nebraska over 4 years (1989 to 1992) and also expressed slightly more leaf resistance to common blight than 'Othello' and 'UI- 114' (Table 1). 'Chase'

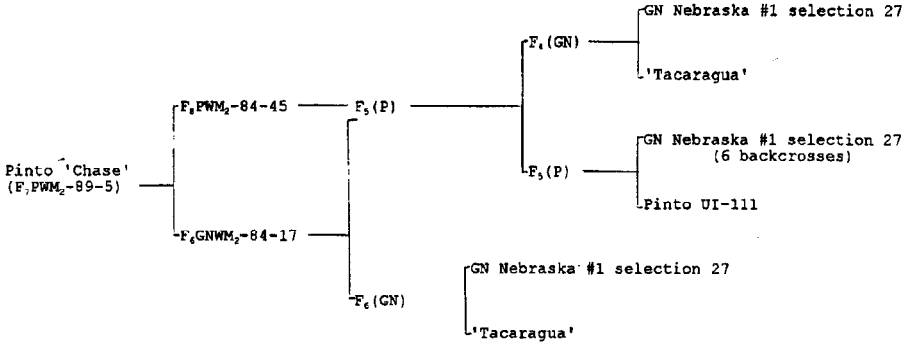

Fig. 1. Pedigree of 'Chase' Pinto bean (*Phaseolus vulgaris* L.) (formerly F_7PWM_2-89-5). GN = Great Northern, P = Pinto, WM_2 = designation of a particular white mold nursery.

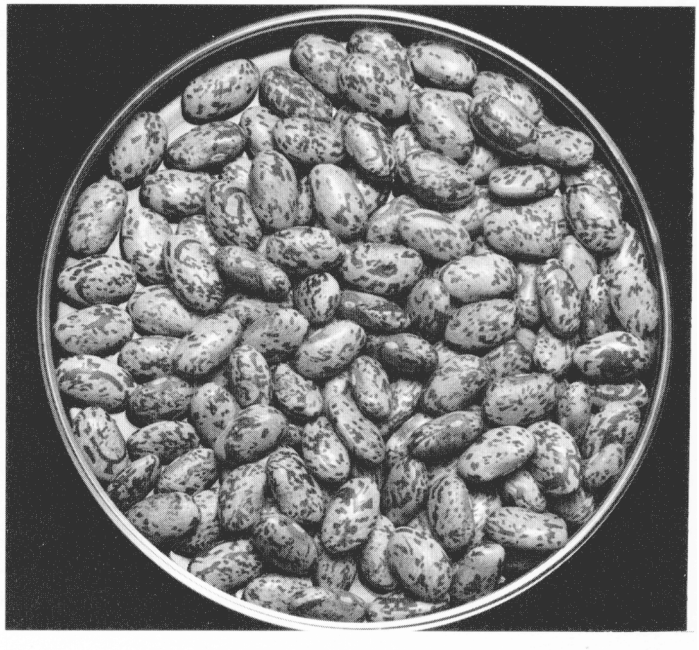

Fig. 2. Seed of 'Chase' Pinto bean (*Phaseolus vulgaris* L.) (formerly PWM_2-89-5).

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Table 1. Summary of disease reactions of Pinto bean cultivars (*Phaseolus vulgaris* L.).

	Common blight (NP)[z] (leaf reaction ratings)				Leaf area diseased (%)			White mold incidence (%)[v]			
					Halo blight (NP)[y]	Brown spot (S)[x]	Rust reaction (NP)[w]	M	CDBN (M)	CO	BCMV NY-15
Cultivar	1991	1991	1992	1992	1982	1992	1989–92	1989	1991	1992	reaction[u], 1992
Chase	2.5	2.5	2.0	2.5	4	0	I or R	27	8	18	S
Othello	3.0	3.5	2.7	5.0	26	34	S	---	27	16	R
UI-114	---	2.5	2.7	5.0	10	43	S	70	21	38	R
$LSD_{0.05}$	1.0	0.9	0.9	1.4	10	25	---	27	20	---	---

[z]NP = North Platte, Neb., separate inoculated nurseries. Common blight rating scale: 1 = no lesions; 2 = 1% to 5%; 3 = >5% to 25%; 4 = >25% to 50%; and 5 = ≥51% of leaf area with lesions (source: D. Coyne).
[y]NP = North Platte, Neb., cooperative dry bean nursery naturally infected with halo blight (source: D. Nuland).
[x]S = Scottsbluff, Neb., cooperative dry bean nursery naturally infected with brown spot disease (source: D. Nuland).
[w]NP = North Platte, Neb., rust-inoculated nurseries; I = immune, R = resistant (nonsporulating or sporulating, pustule diameter <0.3 mm), S = susceptible (pustule size diameter >0.3 mm) (source: J. Steadman and D. Lindgren).
[v]White mold nurseries naturally infected at Mitchell (M), Neb., and Amherst (CO), Colo. CDBN = cooperative dry bean nursery at Mitchell conducted by D. Nuland. The white mold readings from the CO nursery were recorded by Howard Schwartz, Colorado.
[u]S = susceptible (mild delayed reaction with the NY-15 Zaumeyer strain) (source: J. Myers, Idaho) and typical symptoms with the NY-15 Providenti strain (source: M. Silbernagel, Agricultural Research Service, Washington).

Table 2. Mean yield (in kilograms per hectare) of Pinto bean cultivars (*Phaseolus vulgaris* L.) in Nebraska (1989–92).

	1989	1990		1991			1992		
Cultivar	WMN[z]	CDBN[y]	NDN[x]	WMN[z]	CDBN[y]	MRPN[w]	CDBN(M)[y]	CDBN(S)[y]	MRPN[w]
Chase	1948	2686	2877	2135	3394	2032	1535	2134	1724
Othello	---	2871	2889	2134	2937	2214	1390	1657	1509
UI-114	1141	2119	2212	2105	2586	1611	1221	1469	821
$LSD_{0.05}$	507	336	415	679	422	684	347	355	273

[z]WMN = White mold disease nurseries, Mitchell (source: D. Coyne, 1989; D. Nuland, 1991).
[y]CDBN = Cooperative dry bean nurseries, Scottsbluff (S) and Mitchell (M), Neb. (source: D. Nuland; coordinator: J. Myers, Univ. of Idaho, Kimberly).
[x]NDN = Nondisease nursery, Mitchell, Neb. (source: D. Coyne).
[w]MRPN = Midwest Regional Performance Nursery, Scottsbluff, Neb. (source: D. Coyne; coordinator: K. Grafton, North Dakota State Univ., Fargo).

also was observed to have high resistance to halo blight and brown spot diseases in naturally infected nurseries (Table 1). Although the percentage of plants with white mold were similar for 'Chase' and 'Othello', 'UI-114' was more susceptible to white mold than the above entries (Table 1). 'Chase' is susceptible to BCMV NY-15 strain. This is the first Pinto resistant to this variety of pathogens and is recommended for planting where rust and common blight are problems in western Nebraska and eastern Colorado. 'Chase' (rating= 2) and 'Tacaragua' (rating = 1) were highly resistant and GN 'Starlight' (rating = 6) susceptible to potato leafhopper "bum" injury in other trials containing 22 entries (unsprayed) at North Platte in 1991 and 1992 using a rating scale where 1 = no plant injury, 2 = trace, 3 = slight, 4 = moderate, 5 = severe, and 6 = very severe. Similar ratings were observed for these cultivars in both years and the cultivars differed significantly [$LSD_{0.05}$ = 0.7 (1991); $LSD_{0.05}$ = 0.9 (1992)]. Pinto 'UI-114' and 'Othello' were not included in those trials.

Under nondisease conditions, the yields of 'Chase' were similar to 'Othello' and generally exceeded those of Pinto 'UI-114' (Table 2). In contrast, under rust and bacterial blight conditions (1992), the yields of 'Chase' exceeded those of 'Othello' and 'UI-114' (Table 2). 'Chase' yielded more than 'UI-114' 86% of the time and 'Othello' 80% of the time, based on the combined analysis (Eskridge and Mumm, 1992) of 15 trials conducted in Nebraska and Colorado in 1992. The yield of 'Chase' also exceeded 'UI-114' and 'Othello' in the midwest regional nursery in 1992 (Table 2). The seed weight of 'Chase' (3625 seeds/kg) was slightly lower than the two control cultivars (2959 seeds/kg) (Nuland, 1992). The seed shape of 'Chase' is similar to that of Pinto 'UI-114', but the background color of 'Chase' is darker than that of Pinto 'UI-114'.

'Chase' (86 to 94 days) generally matured several days later than 'Othello' (83 to 89 days) or 'UI-114' (83 to 93 days) in 1990 to 1992 in Nebraska. The plant height and spread of 'Chase' was nearly similar to the above two controls (data not included). 'Chase' has a Type III plant habit. There was no significant difference in seedcoat cracking, using Dickson's dropping method (Dickson and Boettger, 1977), and in cooking time, using the "Mattson" cooker (Jackson and Varriono-Marston, 1981), between 'Chase' and Pinto 'UI-111' (data not included).

Availability

Foundation seed of 'Chase' was produced in California and in Nebraska in 1992 to grow certified seed in Nebraska in 1993. Small samples of seed (500 g) for trial may be obtained from Ronald Helsing, Manager, Nebraska Foundation Seed Division, Agronomy Dept., Univ. of Nebraska, Lincoln, NE 68583. Plant variety protection will be sought.

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