

North Dakota State University - Dry Bean Breeding Program

ND Falcon (ND121448) Pinto

Attributes:

- Competitive seed yield compared to other commercial cultivars
- Excellent upright architecture
- Resistance to rust (race 20-3) via *Ur-11* gene
- Resistance to Soybean Cyst Nematode (SCN)
- Resistance to BCMV (*I* gene)
- Uniform drydown
- Good canning quality

Limitations:

- Later maturity compared with other commercial cultivars.

ND Falcon pinto is the result of a cross between breeding line NDZ06218 and Kimberly (Figure 1). NDSU Breeding line NDZ06248 is a complex cross series involving some sources of resistance to Common Bacterial Blight and upright plant architecture and high seed yield. Kimberly is a pinto cultivar released by the University of Idaho with excellent seed quality and high seed yield (Singh et al., 2008). It also has at least three genes for rust resistance (*Ur-3*, *Ur-6*, *Ur-11*).

ND Falcon has excellent upright architecture (type IIa) with short vines. Under North Dakota conditions (Tables 1 and 2), ND Falcon shows slightly higher seed yield compared with other pinto cultivars commonly grown in the region, average plant height is 53 cm, seed size is 36.7 g per 100 seeds, and matures in approximately 105 days. ND Falcon has white flowers and based on greenhouse and field tests, it is resistant to the new race of rust (20-3) predominant in the region and BCMV. Based on greenhouse evaluations (Table 3), ND Falcon showed resistance to Soybean Cyst Nematode (female index=16.4). Other agronomic traits of economic importance such as canning quality, seed shape/size, and maturity are within commercial acceptable ranges.

Singh, S. P., H. Terán, M. Lema, M.F. Dennis, R. Hayes, and C. Robinson. 2008. Breeding for slow-darkening, high-yielding, broadly adapted dry bean pinto 'Kimberly' and 'Shoshone'. J. Plant Registrations 2:180-186.

Table 1. Seed Yield (cwt/Acre) of ND Falcon pinto bean compared to commercial checks across 22 environments in North Dakota between 2013 and 2018.

Year	Year/Trial/Location [†]	ND Falcon	Lariat	La Paz	Windbreaker	Monterrey
cwt/Acre						
2013	13 PPYT CAR	14.4	16.9	-	-	-
2013	13 PPYT HAT	10.0	13.7	-	-	-
2013	13 PPYT PRO	22.0	24.4	-	-	-
2014	14 PPYT HAT	24.3	25.5	34.5	23.9	-
2014	14 PPYT JOH	41.6	40.2	37.9	35.3	-
2014	14 PPYT PRO	25.1	18.7	21.3	19.7	-
2015	15 PAYT CAR	17.4	12.6	14.6	19.0	19.3
2015	15 PAYT HAT	16.4	22.5	20.7	20.9	24.5
2015	15 PAYT JOH	24.3	20.5	15.8	17.7	19.2
2015	15 PAYT PRO	19.1	17.4	15.6	14.1	18.1
2016	16 PAYT CAR	14.0	13.5	13.6	14.4	10.4
2016	16 PAYT HAT	27.7	23.8	27.4	30.1	25.6
2016	16 PAYT PRO	22.4	20.7	20.4	21.2	19.9
2016	16 PVT HAT	30.6	28.6	31.3	32.2	32.4
2016	16 ADM NOR	39.6	-	40.9	40.9	41.1
2017	17 PAYT CAR	23.8	21.1	22.1	20.1	24.1
2017	17 PAYT HAT	22.6	25.8	27.1	21.6	27.8
2017	17 PVT FRR	21.8	21.6	25.8	22.8	27.7
2017	17 PVT HAT	25.5	24.7	27.1	22.2	27.6
2017	17 ADM NOR	25.5	-	27.9	25.8	25.7
2018	17 PVT FRR	26.1	22.4	24.3	21.6	21.5
2018	17 PVT HAT	19.2	17.8	19.3	23.9	22.5
Total Means*						
21 common environments		23.3a	21.6a			
19 common environments		24.8a		24.6a	23.5a	
16 common environments		23.5a				24.2a

*. Different letters indicate significant differences ($P \leq 0.05$) based on paired t-test.

†. Trials: PPYT, Pinto Preliminary Yield Trial, PAYT, Pinto Advanced Yield Trial, PVT, Pinto Variety Trial, MRPN, Midwest Regional Performance Nursery, ADM, Acher Daniels Midland Trial.

Locations: HAT-Hatton, PRO-Prosper, FRR-Forest River, CAR-Carrington, JOH-Johnstown, NOR-Northwood, COL-Fort Collins-CO, MIC-Saginaw-MI, NEB-Scottsbluff-NE,

Table 2. Other agronomic traits of ND Falcon pinto bean compared to commercial checks across 14 environments in North Dakota between 2013 and 2016.

Genotype	100-seed	Days to	Plant	†Canning	‡Rust
	Weight	Maturity	Height	Score	Race 20-3
	g ± SD	d ± SD	cm ± SD	1-7 Score	1-6 Score
ND Falcon	37.0 ± 4	103 ± 6	53 ± 8	4.1 ± 1	2+
Lariat	37.6 ± 4	100 ± 7	51 ± 8	4.7 ± 1	6
La Paz	35.0 ± 4	99 ± 5	53 ± 7	2.9 ± 1	6
Windbreaker	38.2 ± 3	96 ± 8	45 ± 3	5.2 ± 1	6
Monterrey	35.5 ± 4	99 ± 6	53 ± 7	3.0 ± 1	5

†. Canning quality is a visual score where 1=unacceptable, 2=poor, 3-4=average, 5-6=above average, and 7=Excellent. Canning based on average scores from 2 locations.

‡. Rust CIAT scale score based on uredinia diameter: 1-3 Resistant and 4-6 Susceptible. 1=No visible symptoms, 2=Necrotic flecks or spots without sporulation, 3=Uredinia ≤ 300 µm in diameter, 4=Uredinia 300 – 499 µm in diameter, 5=Uredinia 500 – 799 µm in diameter, 6=Uredinia ≥800 µm in diameter. Rust results based on 2 greenhouse evaluations. Field observations at least 4 trials confirmed the same results.

Table 3. Greenhouse screening for Soybean Cyst Nematode (SCN). Data provided by B. Nelson and S. Jain.

Date	ND Falcon	Barnes (Susc. soybean)	Female Index†
	Number of females		FI
Mar-18	51	626	8.2
Apr-18	69	206	33.5
May-18	15	201	7.5
Mean	45	344	16.4

†. Female Index (FI)=(N_x/N_s)x100, where N_x = average number of females on the test cultivar and N_s = average number of females on the standard susceptible cultivar Lee 74 (or Barnes for North Dakota evaluations).

Illinois scale:

HR, highly resistant	FI = <10
R, resistant	FI = 10-24
MR, moderately resistant.....	FI = 25-39
LR, low resistance.....	FI = 40 to 59
NR or N, no effective resistance.....	FI = ≥ 60

Niblack, T. L. 2005. Soybean Cyst Nematode Management Reconsidered. Plant Disease 89: 1020-1026.