

FARAÓN-INIA, A NEW WINTER TRITICALE (*×Triticosecale* Wittmack) FOR SOUTHERN CHILE

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ABSTRACT

Faraón-INIA is a new winter triticale (*×Triticosecale* Wittmack) cultivar released by the National Wheat Program of the Instituto de Investigaciones Agropecuarias INIA in Chile. It is derived from an F₉ material received from Nordsaat, Germany, under a germplasm exchange agreement signed in 2006 by both institutions. The crossing was Piano/Focus with Nord 93.7548 pedigree. Faraón-INIA has a winter growth habit, a short stem (semi-dwarf), with a mean height of 106 cm. The spike is long, compact, decumbent, white, and awned. The grain is soft, yellow, with 1000-grain weight of 36 g, and a mean of hectoliter weight of 76 kg hL⁻¹. It is resistant to stripe rust (*Puccinia striiformis* West. f. sp. *tritici*) and leaf rust (*Puccinia triticina* Erikss.) as well as moderately resistant to septoria leaf blotch. Its mean yield for four seasons in three different locations: Temuco (38°50' S, 72°25' W), Traiguén (38°45' S, 72°38' W), and Purranque (36°31' S, 71°54' W) varied between 8.2 and 15.0 t ha⁻¹ with a general mean of 11.0 t ha⁻¹. Bromatological analysis of the grain showed good protein content (10.6%) and a generally better quality than other triticale cultivars. Based on the above information, Faraón-INIA is recommended for use as animal feed in Southern Chile.

Key words: winter triticale, high-yielding cultivar, quality, *Triticosecale*.

INTRODUCTION

Triticale (*×Triticosecale* Wittmack) is a self-pollinating cereal which is artificially produced by crossing wheat (*Triticum* spp.) and rye (*Secale cereale* L.). After more than 100 yr of research of this species the improvement and agronomic management have been very important (Varughese *et al.*, 1987; Mellado *et al.*, 2008). Studies in triticale started in Chile in 1970 when experimental lines from Mexico (Centro Internacional de Mejoramiento de Maíz y Trigo, CIMMYT) through the Sociedad Nacional de Agricultura (Mayorga, 1971) were introduced and tested. Then, the Pontificia Universidad Católica (Parodi and Nebreda, 1982), the Instituto de Investigaciones Agropecuarias INIA (Hewstone, 1990), and Semillas Baer begin genetics and crop management research studies of this cereal. New triticale cultivars currently have a grain similar to wheat, good agronomic characteristic plants, resistant to lodging, and wide adapted so that it is

possible to sow them in different parts of the country. In fact, the major planting area in Chile is concentrated in La Araucanía Region (INE, 2010). The National Wheat Program of INIA, as a way to enhance this crop in the country, has developed triticale cultivars adapted to the southern zone for more than 25 yr. The new cultivar Faraón-INIA offers a new alternative for winter sowing.

ORIGIN, CROSSING, AND PEDIGREE

Faraón-INIA is derived from an F₉ material received from Nordsaat, Germany, under a germplasm exchange agreement signed in 2006 by both institutions. The crossing was Piano/Focus with Nord 93.7548 pedigree. Faraón-INIA has been evaluated in yield trials in INIA Carillanca, Temuco (38°50' S, 72°25' W) since 2005-2006 season, as well as in different locations such as Traiguén (38°45' S, 72°38' W) and Purranque (36°31' S, 71°54' W).

MORPHOLOGICAL DESCRIPTION OF THE PLANT

Faraón-INIA has a winter growth habit, a short stem (semi-dwarf), with a mean height of 106 cm shorter

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than the spring var. Aguacero-INIA (115 cm), the facultative var. Lonko BAER (132 cm), and similar to the facultative var. Peteroa-INIA (105 cm). The spike is long, compact, decumbent, white, and with awns along its full length. The grain is soft, yellow, with a 1000 grains weight of 36 g, and an average of hectoliter weight of 76 kg hL⁻¹.

AGRONOMIC CHARACTERISTICS

Faraón-INIA has a medium-length stem with an acceptable resistance to lodging. In Temuco (INIA Carillanca) its vegetative period from sowing to heading is 10 to 12 d later than var. Peteroa-INIA. When it is sown in Carillanca on 14 May, heading occurs between 10 and 14 of November (approximately 176 to 180 d from sowing to heading). In Purranque sowed on 23 May, heading occurs around 2 December (approximately 189 d from sowing to heading) which is around 4 to 6 d later than Peteroa-INIA and Lonko BAER. Considering that this triticale requires vernalization must be recommended for early autumn and winter sowing in South Central and Southern Chile.

PHYTOPATHOLOGICAL CHARACTERISTICS

Faraón-INIA is resistant to stripe rust (*Puccinia striiformis* West. *f. sp. tritici*) and leaf rust (*Puccinia triticina* Erikss.) according to Cobb's modified scale (Peterson *et al.*, 1984; Stubbs *et al.*, 1986), as well as moderately resistant to septoria leaf blotch (*Mycosphaerella graminicola* (Fuckel) J. Schröt.) according to the Saari and Prescott double digit scale (1975) (Tottman and Makepeace, 1979), and is resistant to powdery mildew caused by the

Blumeria graminis D.C. *f. sp. tritici* Marchal fungus. It is also tolerant to leaf scald (*Rhynchosporium secalis* (Dudd) J.J. Davis), a disease affecting leaves of some triticales (Madariaga and Mellado, 1992).

GRAIN YIELD

In yield trials carried out from Traiguén to Purranque under different agroclimatic conditions, Faraón-INIA has shown a stable yield, higher than commercial vars. Lonko BAER and Peteroa-INIA. The mean yield in three locations during 4 yr evaluation was 11.0 t ha⁻¹, which is higher than Peteroa-INIA and Lonko BAER, respectively. The biggest difference between Faraón-INIA and these varieties was obtained in Purranque where it exceeded yields of 15 t ha⁻¹ in all three seasons (Table 1).

QUALITY AND USES

Faraón-INIA is a triticale with acceptable hectoliter weight (74.8 kg hL⁻¹), similar to Peteroa-INIA (73.8 kg hL⁻¹), but lower than Lonko BAER (76.4 kg hL⁻¹) for values observed in the four seasons and three locations (Table 2). Its grain protein percentage is higher than 10.0%, dry matter digestibility over 95.0%, metabolizable energy higher than 3.3 Mcal kg⁻¹, and 1.9% crude fiber (Table 3). Grain bromatological analysis showed good protein content (10.6%) and a generally better quality than other triticale cultivars. Based on the above information, Faraón-INIA is recommended for use as animal feed in Southern Chile.

Table 1. Mean grain yield of var. Faraón-INIA compared to Peteroa-INIA and Lonko BAER in three locations over four seasons (2005-2006 to 2008-2009).

Location	Variety	Crop seasons				Mean
		2005-2006	2006-2007	2007-2008	2008-2009	
		t ha ⁻¹				
Traiguén	Faraón-INIA	7.3a	7.6a	8.9a	9.0a	8.2
	Peteroa-INIA	6.2b	4.7b	5.9b	4.9c	5.4
	Lonko BAER	6.4b	4.9b	4.5b	6.5b	5.6
Temuco	Faraón-INIA	9.6a	11.5a	10.1a	7.5a	9.7
	Peteroa-INIA	7.5b	8.5b	8.4b	5.5b	7.5
	Lonko BAER	8.2b	7.3b	3.9c	6.6b	6.5
Purranque	Faraón-INIA	16.6a	15.9a	16.9a	10.7a	15.0
	Peteroa-INIA	14.5b	12.7b	13.5b	10.5a	12.8
	Lonko BAER	9.4c	8.3c	10.6c	10.3a	9.7

Different letters in columns and for each location indicate differences according to Tukey test ($P < 0.05$).

Table 2. Mean hectoliter weight of var. Faraón-INIA compared to Peteroa-INIA in three locations over four seasons (2005-2006 to 2008-2009).

Location	Variety	Crop seasons				Mean
		2005-2006	2006-2007	2007-2008	2008-2009	
		kg hL ⁻¹				
Traiguén	Faraón-INIA	76.8a	75.4a	76.1a	76.1a	76.1
	Peteroa-INIA	74.5b	73.5a	74.0a	74.0b	74.0
	Lonko BAER	77.1a	76.8a	74.5a	76.5a	76.2
Carillanca	Faraón-INIA	72.7a	75.7b	75.5b	75.5a	74.9
	Peteroa-INIA	70.3a	77.7a	75.3b	74.3a	74.4
	Lonko BAER	73.4a	78.9a	77.6a	75.2a	76.2
Purranque	Faraón-INIA	70.2b	72.9b	75.5a	74.5b	73.3
	Peteroa-INIA	72.8b	74.3b	73.2b	72.2b	73.1
	Lonko BAER	76.5a	78.5a	76.4b	76.2a	76.9

Different letters in columns and for each location indicate differences according to Tukey test ($P < 0.05$).

Table 3. Quality characteristics of triticale var. Faraón-INIA compared to three commercial varieties. Mean of two locations (Temuco and Purranque) and two seasons (2006-2007 and 2007-2008).

Parameters ^a	Faraón-INIA	Aguacero-INIA	Peteroa-INIA	Lonko BAER
Dry matter ¹ , %	85.60	86.60	86.30	86.40
Ash, %	1.60	1.70	1.90	1.60
Total proteins ² , % (N x 6.25)	10.60	13.50	13.00	10.80
Dry matter digestibility ³ , %	95.30	93.70	93.60	93.20
Digestibility ⁴ , %	93.50	91.60	91.40	91.10
Metabolizable energy ⁵ , Mcal kg ⁻¹	3.32	3.26	3.25	3.24
Crude fiber ⁶ , %	1.90	2.60	2.30	2.60
Neutral detergent fiber ⁷ , %	14.10	15.40	14.20	15.30
Ether extract ⁸ , %	0.90	1.30	1.50	1.50
Non-structural carbon ⁹ , %	71.10	65.60	67.20	68.60
Wet gluten ¹⁰ , %	10.30	21.00	20.00	-

^aMean values (Bromatology Laboratory, INIA Remehue).

¹Values > 85 correspond to a good value.

²Values > 12% correspond to a good value.

³Values > 90% correspond to a good value.

⁴Values > 90% correspond to a good value.

⁵Values > 3.0% correspond to a good value.

⁶Values < 2% correspond to a good value.

⁷Values > 12% correspond to a good value.

⁸Values < 1% correspond to a good value.

⁹Values > 70% correspond to a good value.

¹⁰Values < 20% correspond to a good value (considering triticale for animal feed).

CULTIVATION AREA AND SOWING DATES

Faraón-INIA is recommended for locations between the La Araucanía and Los Lagos Regions, including Los Ríos Region. Due to its long vegetative cycle, early sowing from April to May is recommended even though it has good development and adequate spike production when sown until the end of June from Temuco southward.

RESUMEN

Faraón-INIA, un nuevo triticale de invierno (×*Triticosecale* Wittmack) para el sur de Chile. Faraón-INIA es un nuevo cultivar de triticale (×*Triticosecale* Wittmack) liberado por el Programa Nacional de Trigo del Instituto de Investigaciones Agropecuarias INIA, Chile. Este cultivar deriva de un material F₉ recibido de la empresa Nordsaat, Alemania, bajo un convenio formal firmado en el 2006 entre ambas instituciones. La cruza es Piano/Focus, y el pedigrí Nord-93.7548. Faraón-

INIA tiene un hábito de desarrollo invernal y caña corta (semienano), con un promedio de altura de 106 cm. La espiga es larga, compacta, decumbente, blanca y barbada. El grano es blando, amarillo, con un peso de 100 granos de 36 g y un promedio de 76 kg hL⁻¹ de peso del hectolitro. Es resistente a roya estriada (*Puccinia striiformis* West. f. sp. *tritici*) y roya colorada de la hoja (*Puccinia triticina* Erikss.) y moderadamente resistente a septoria leaf blotch. Su rendimiento promedio para cuatro temporadas varió entre 8.2 y 15.0 t ha⁻¹ en tres localidades diferentes: Temuco (38°50' S, 72°25' O), Traiguén (38°45' S, 72°38' O) y Purranque (36°31' S, 71°54' O), con un promedio general de 11,0 t ha⁻¹. El análisis bromatológico de los granos mostró buen contenido de proteína (10.6%) y en general mejor calidad que otras variedades de triticale. Sobre la base de lo anterior, Faraón-INIA se recomienda para ser utilizado en la alimentación animal en el Sur de Chile.

Palabras clave: triticale invernal, cultivar de alto rendimiento, calidad, *Triticosecale*.

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