

## NEW FIBRE FLAX VARIETY ‘DANGIAI’

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### Abstract

Fibre flax breeding has been carried out in Lithuania since 1922. By the year 2005 eighteen fibre flax varieties had been developed in our country. The present paper presents the new fibre flax variety ‘Dangiai’ (breeding line No. 2018-8) bred at the Upytė Research Station of the Lithuanian institute of Agriculture using the method of intervarietal crossing.

‘Dangiai’ is a blue flowering, moderately early ripening variety, brown-seeded, resistant to lodging, with a 1000 seed weight of 4.73 g, good fibre quality suitable for textile production.

Averaged data of 2 years’ competitive trials showed that the new variety ‘Dangiai’ (when compared to the standard ‘Hermes’) had higher fibre content, thinner fibre (higher divisibility), higher quality number, taller plants, produced more capsules per plant, had shorter growing period, plants were more resistant to *Fusarium spp.* and *Colletotrichum lini*. Compared with the variety ‘Belinka’ (quality standard) ‘Dangiai’ had higher fibre content, firmer fibre and better divisibility.

Key words: breeding, fibre flax, fiber quality, variety, yield.

### Introduction

Fibre flax breeding has been carried out in Lithuania since 1922 /Bačelis, 1998/. During the period from 1922 to 2005 eighteen fibre flax varieties were developed in our country /Bačelis, 2001/. Fibre flax breeding in Lithuania was started at the Breeding Station in Dotnuva. It was continued in Savitiškis Research Station, and since 1965 – at the Upytė Research Station of the Lithuanian Institute of Agriculture.

Initial material for fibre flax breeding must be diverse and abundant, also must meet the key requirements under local conditions /Rosenberg, 1995/. The tested varieties, which most closely meet the requirements set for the direction of the breeding work, are used for intervarietal crossings with a view to developing new initial material.

High fibre quality is one of the key requirements in fibre flax breeding for textile purposes /Heller, Rulskij, 2002/. Furthermore, new flax varieties should be resistant to lodging and diseases /Trouve, 1996; Doronin et al., 1998; Krylova et al., 2002/.

Our aim is to develop high yielding, lodging resistant, with a high fibre output and quality, less susceptible to fungal diseases, with a moderately long vegetative growth period, adapted to Lithuania’s soil and climate conditions new fibre flax varieties.

## Materials and methods

The flax breeding was conducted on a Eutri-Endohypogleyic Cambisol /Buivy-daitė et al., 2001/. Flax was sown after winter wheat. Conventional cultivation practices were used. Fibre flax breeding was carried out according to the following scheme: 1) nurseries of initial material (collection, hybrids, mutants), 2) breeding nursery, 3) hybrids nursery, 4) selection nursery, 5) control nursery, 6) initial variety trials, 7) competitive variety trials. In the nursery of initial material varieties and examples are sown in the plots of 0.2–1.0 m<sup>2</sup>, and in the breeding, selection and control nurseries – in the plots of 0.2–4.0 m<sup>2</sup>. In the control nursery flax is sown in 4–5 replications. Initial and competitive variety trials involve 3–4 replications, the size of a record plot is 11.2 and 16.0 m<sup>2</sup> respectively. All field trials were conducted (with a few modifications) in compliance with the published methodology /Metodičeskie ukazaniya..., 1978; Rogash et al., 1987/.

In the competitive and initial variety trials the plots were sown by a sowing machine SNL-16 at a seed rate of 25 million seed per hectare, at 10 cm space between rows. In the other nurseries the plots were sown manually at a seed rate of 22 million seed per ha. Insecticides were sprayed against flax flea beetles and herbicides were used to control weeds.

During the vegetative growth period of flax we conducted phenological observations. Lodging resistance and fungal diseases on the natural background were assessed /Metodičeskie ukazaniya..., 1969/. Flax was pulled at the stage of early yellow ripeness, threshed by a MS thresher, the stems were retted in warm (33–37 °C) water, then stems were broken up by a machine tool SMT-200, fibre was hacked by a hackles number 9 and 13. Number of long fibre was determined in the laboratory, flexibility – by a device G-2, strength of fibre – by a device DK-60 and thinness (divisibility) – following special methodology by counting separate fibres in a fibre sample, the length of which is 1 cm, mass 10 mg). Long fibre rupture length (in km) was calculated using the formula:  $RL \text{ (in km)} = 0.1 \times \text{Flexibility (in mm)} + 0.2 \times \text{tenacity (in kg F)} + 0.013 \times \text{Fineness (in units)} + 2.1$ ; where: 0.1; 0.2; 0.013 and 2.1 are constants /Metodiki technologičeskoj..., 1961/. Morphological analysis of plants was carried out also. Stem linseed and fibre yield was calculated using analysis of variance /Tarakanovas, Raudonius, 2003/.

Meteorological conditions during the period 1978–2005 were not every year favourable and had a marked effect on the yield. The years 1990, 1991, 1993, 1996, 1997 and 2000 were favourable for flax growing and good linseed and fibre yield was obtained in these years. In the years 1992, 1994 and 1999 the hot and dry weather in June and July markedly declined flax yield. In the year 1998 very abundant precipitation in July lodged the flax plants, which resulted in a marked deterioration of flax produce quality. In 2001 the weather conditions were adverse, especially in the second half of the growing season. Heavy precipitation lodged flax plants. The year 2002 was characterised by a deficit of moisture during the growing season. In 2003 because the deficit of precipitation in the first half of the growing season occurred, flax did not develop well, the end of the growing season was rainy and the flax stand was partially lodged.

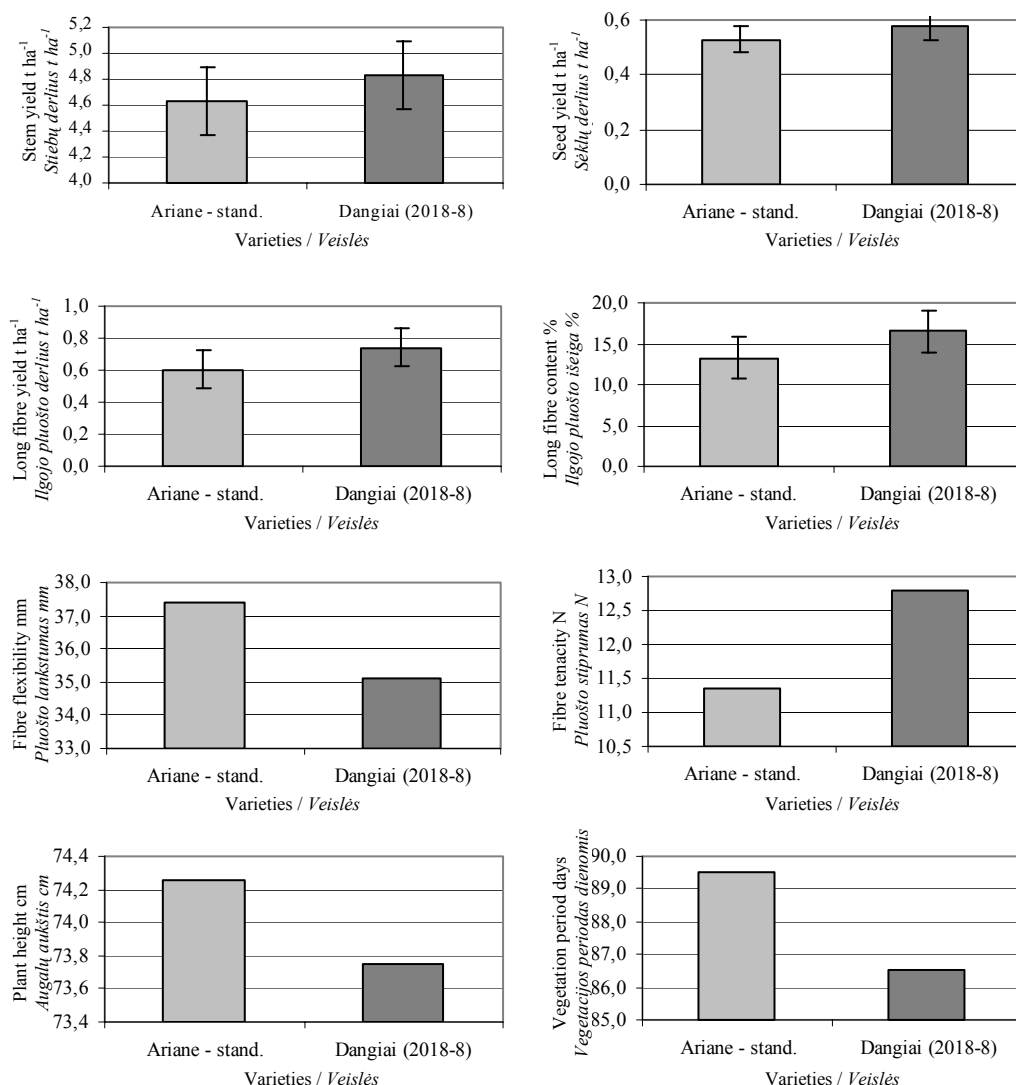
## Results and Discussion

The new fibre flax variety ‘Dangiai’ (breeding line No. 2018-8) has been bred at the Upytė Research Station of the Lithuanian Institute of Agriculture using the method

of intervarietal crossing. In 1978 female variety ‘Milenium’ of Polish origin was crossed with flax variety ‘Belan’ developed in Check Republic.

‘Dangiai’ is blue flowering, moderately early ripening variety, lodging resistant, seeds are brown, 1000 seeds weight – around 4.73 g, fibre quality is good, fibre is suitable for textile purposes.

This breeding line was tested in the control nursery in 2001–2002 (Figure), ‘Dangiai’ produced higher stem, seed and long fibre yield when compared to the standard variety ‘Ariane’. Flax ‘Dangiai’ was earlier ripening, had higher fibre content, firmer fibre than that of ‘Ariane’ in the control nursery.



**Figure.** Some characteristics of fibre flax variety ‘Dangiai’ in the control nursery  
**Paveikslas.** Veislės ‘Dangiai’ linų rodikliai kontroliniame auginyje  
 Uptytė, 2001–2002

In the initial variety trials ‘Dangiai’ was tested in 2003, in the competitive variety trials – in 2004–2005.

Since 2007 DUS and VCU tests for this variety have been carried out. K. Bačelis is the author of ‘Dangiai, since 2005 initial variety testing has been continued by Z. Jankauskienė.

Average data of 2 years competitive trials showed that the new variety ‘Dangiai’ compared to the standard ‘Hermes’ (Table) had higher fibre content, thinner fibre (higher divisibility data), higher quality number, taller plants, produced more capsules per plant, had shorter vegetation period, plants were more resistant to *Fusarium spp.* and *Colletotrichum lini*.

**Table.** Some agrobiological characteristics of fibre flax variety ‘Dangiai’

**Lentelė.** Veislės ‘Dangiai’ linų agrobiologiniai rodikliai

Uptytė, competitive variety trials, average 2004–2005

Indices <i>Rodikliai</i>	‘Belinka’	‘Hermes’	‘Dangiai’	‘Dangiai’ compared to ‘Belinka’ % ‘Dangiai’ lyginant su ‘Belinka’ %	‘Dangiai’ compared to ‘Hermes’ % ‘Dangiai’ lyginant su ‘Hermes’ %
Yield t ha <sup>-1</sup> / <i>Derlius t ha<sup>-1</sup></i>					
Stem / <i>Stiebu</i> (LSD <sub>05</sub> /R <sub>05</sub> 0.67)	-	5.85	5.57	-	95.2
Seed / <i>Sėmenų</i> (LSD <sub>05</sub> /R <sub>05</sub> 0.11)	-	0.74	0.71	-	96.0
Long fibre / <i>Ilgojo pluošto</i> (LSD <sub>05</sub> /R <sub>05</sub> 0.19)	-	1.57	1.52	-	96.8
Long fibre content % <i>Ilgojo pluošto išeiga %</i>	16.3	26.5	27.2	166.9	102.6
Long fibre flexibility mm <i>Ilgojo pluošto lankstumas mm</i>	42.5	38.1	35.8	84.2	94.0
Long fibre strength kg F <i>Ilgojo pluošto stiprumas kg j</i>	14.1	15.6	15.3	108.5	98.1
Long fibre divisibility units <i>Ilgojo pluošto susiskaidymas vnt.</i>	246	248	275	111.8	110.9
Long fibre rupture length km <i>Ilgojo pluošto trūkimo ilgis km</i>	12.4	12.3	12.3	99.2	100.0
Long fibre quality Nb. <i>Ilgojo pluošto kokybinis numeris</i>	12.6	11.9	12.4	98.4	104.2
Plant height cm <i>Augalų aukštis cm</i>	-	73.8	76.3	-	103.4
Technical stem length cm <i>Techninis stiebo ilgis cm</i>	-	69.3	68.8	-	99.3
Amm. of capsules units per plant <i>Galvenų skaičius vnt. ant augalo</i>	-	1.80	2.50	-	138.9
Vegetation period days <i>Vegetacijos periodas dienomis</i>	-	91	87	-	85.6
Resistant to lodging points (9=unlodged) <i>Atsparumas išgulumui balais (9=neišgulę)</i>	-	8.95	8.55	-	95.5
Disease incidence on stems % <i>Ligų išplitimas ant stiebu %</i>	-	37.0	10.6	-	28.6

Fibre quality of the variety 'Belinka' is known as the standard of good quality, thus for the evaluation of fibre quality in our trials the variety 'Belinka' was chosen as a reference (standard) variety. When compared to 'Belinka' (quality standard), the new variety 'Dangiai' had higher fibre content, firmer fibre and better divisibility.

### Conclusions

1. In the control nursery in 2001–2002 'Dangiai' (breeding line No. 2018-8) produced higher stem, seed and long fibre yield compared to the standard variety 'Ariane'. Flax 'Dangiai' was earlier ripening, had higher fibre content, firmer fibre than that of 'Ariane'.

2. In the competitive variety trials the new fibre flax variety 'Dangiai' when compared to the standard 'Hermes', had higher fibre content, thinner fibre (higher divisibility), higher quality number, taller plants, produced more capsules per plant, had shorter vegetation period, plants were more resistant to *Fusarium spp.* and *Colletotrichum lini*.

3. When compared to the variety 'Belinka' (quality standard), the new variety 'Dangiai' had higher fibre content, firmer fibre and better divisibility.

4. 'Dangiai' (breeding line No. 2018-8) is a blue flowering, moderately early ripening, lodging resistant variety the seeds are brown, 1000 seed weight – 4.73 g, fibre quality is good, fibre is suitable for textile production.

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## NAUJA PLUOŠTINIŲ LINŲ VEISLĖ ‘DANGIAI’

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### Santrauka

Pluoštinių linų selekcija Lietuvoje pradėta 1922 m. ir iki 2005 m. sukurta 18 veislių. Selekcinis darbas tęsiamas, tad pristatoma nauja pluoštinių linų veislė. ‘Dangiai’ (selektinė linija Nr. 2018-8) sukurta Lietuvos žemdirbystės instituto Upytės bandymų stotyje naudojant tarpveislinės hibridizacijos metodą.

‘Dangiai’ yra mėlynžiedė, vidutiniškai anksti subręstanti veislė, atspari išgulimui, sėklos rudos, 1000-čio sėklų masė – 4,73 g, gera pluošto kokybė, tinka tekstilei.

Vidutiniais dvejų metų tyrimų konkursiniuose veislių bandymuose duomenimis, naujosios veislės ‘Dangiai’ linai pasižymėjo (lyginat su standartine veisle ‘Hermes’) didesne pluošto išeiga, plonesniu pluoštu, geresniu pluošto kokybiniu numeriu, augalai užaugo aukštesni ir užaugino daugiau galvenų, vegetacijos periodas buvo trumpesnis, augalai buvo atsparesni ligų sukėlėjams *Fusarium spp.* ir *Colletotrichum lini*. Lyginant su pluošto kokybės standartu ‘Belinka’, naujosios veislės linų pluošto išeiga buvo didesnė, pluoštas stipresnis ir plonesnis.

Reikšminiai žodžiai: pluoštiniai linai, derlius, pluošto kokybė, selekcija, veislės.