ÞEMËS ÛKIO MOKSLAI. 2005. Nr. 3. P. 57–62

Selekcija ir sëklininkystë
Selection and Seed Growing
Ñåëåêöèÿ è ñåìåíîâîäñòâî

Efficiency of individual selection method in developing new varieties of narrow-leaved lupine for green manure

Zita Maknickienë

Lithuanian Institute of Agriculture,
Vokë Branch, Þalioji aikðtë 2,
LT-02232 Vilnius,
el. paštas sekretoriatas@voke.lzi.lt

The individual selection method has been employed in narrow-leaved lupine breeding at the Lithuanian Institute of Agriculture's Vokë Branch since 1993, when a collection from the Russian N. Vavilov crop production institute was obtained. Using this method, two narrow-leaved varieties, a narrow-leaved lupine variety 'Derliai' intended for green manure and a narrow-leaved forage lupine variety 'Vilniai', were developed over the period 1995–2003. During this period, not only the afore-mentioned varieties but also six lines of narrow-leaved lupine for green manure that passed all the stages of breeding process and were assessed according to international standards were developed. All the six breeding lines are characterised by a high resistance to fungal diseases, fast growth rate at all growth stages, high seed yield (2.1–2.7 t ha^{-1}) and a short vegetative growth period (82–102 days). The breeding lines are a valuable material from the genetic, breeding and agronomic points of view. These lines will be included in breeding work and the most promising lines will be transferred to the state variety testing trial.

Key words: narrow-leaved lupine for green manure, individual selection, variety, resistance to fungal diseases

INTRODUCTION

A consistent breeding of lupine in Lithuania was started at the Dotnuva plant breeding station in 1934 [3]. In 1947, lupine breeding was transferred from Dotnuva to the Karoliniškes station near Vilnius, and after reorganisation of research institutions lupine breeding was transferred from the Karoliniðkës Station to the Vokë Branch in 1957 where a continuous breeding with yellow lupine (*Lupinus luteus* L.) has been carried out until now. The only narrow-leaved lupine variety 'Snaigiai' for green manure (breeder A. Subaèius) was bred in 1962 using the intervarietal crossing method. Narrow-leaved lupine received a greater interest in 1993 when a collection was obtained from the Russian N. Vavilov crop production institute. Comprehensive research into this species of lupine, conducted during the period 1993–1997, was of special importance, since a high resistance to the new fungal disease of lupine, anthracnose (*Colletotrichtum* gloesporoides (Penz.) Penz & Sass.), was identified in this species [2, 6, 10, 14]. Lupine anthracnose affects all lupine species without exception, and yellow lupine is especially heavily damaged by the disease [11, 12]. Currently, there are no yellow lupine varieties notable for a higher resistance to anthracnose. Therefore yellow forage lupine can only be replaced by a narrow-leaved forage lupine and lupine for green manure, which are characterised by exceptional characteristics such as fast growth rate at all development stages, short growing season, high yield.

During the period 1995–2003, using the individual selection method two narrow-leaved lupine varieties were developed: 'Derliai' for green manure (breeder Z. Maknickienë) and forage lupine variety 'Vilniai' (breeders Z. Maknickienë, J. Lazauskas, A. Subaèius). In this period, not only the afore-mentioned varieties but also numerous valuable breeding lines that had been assessed according to international standards were developed. Using the individual selection method, six narrow-leaved lupine breeding lines for green manure have been developed so far. They are a valuable material from the genetic, breeding, and agronomic points of view, which will be used in subsequent breeding work. The most valuable lines will be transferred to the state variety testing.

The main objective of the breeding work is to develop high yielding, more resistant to fungal diseases early varieties of narrow-leaved lupine for green manure, adapted to Lithuania's climatic zone.

MATERIALS AND METHODS

Lupine breeding crops are grown at LIA Vokë Branch in a six-course crop rotation, with spring cereals as a preceding crop. The soil is Haplic Luvisols (LVh) [1], moderately acid, low in humus (2.0–2.1), nitrogen 0.096–0.117%, phosphorus 113.2–147.3 mg kg^{-1}, potassium 126.4–153.3 mg kg^{-1}.

A conventional soil preparation technology was employed: deep autumn ploughing, two soil cultivations in spring. The herbicide gezagard (2–2.5 kg/ha) was applied for weed control. The fungicide kemikar-T (2 l/t seed) was used for seed treatment.

The chief breeding methods employed were individual selection and intervarietal hybridization. The lupine variety 'Snaigiai' was used as a control.

Lupine breeding is performed according to the approved methodology, following this scheme: 1) collection nursery, 2) hybrid nursery, 3) breeding nursery, 4) control nursery, 5) initial variety trials, 6) competitive variety trials.

During the vegetative growth period, various assessment methods (UPOV, IBPGRI, ÑÝÂ) are applied in all stages of breeding work for the identification of resistance to fungal diseases at three plant growth stages: seedling, bud formation – flowering, and shiny pods. A 9 point scale was used: 1 – very low resistance, diseased plants over 50%, 3 – low resistance, diseased plants 26–50%, 5 – moderate resistance, diseased plants 11–25%, 7 – high resistance, diseased plants 2.5–10%, 9 – very high resistance, diseased plants less than 2.5% [5, 15]. With this end in view, at complete emergence the plants were counted in A and C replications; at the stages of seedling, bud formation – flowering, and shiny pods the anthracnose-affected plants were counted and removed from the plot. At the complete maturity stage, healthy plants were counted and their productivity was estimated. The percentage of fungal-disease-affected plants was identified according to the formula:

$P = (n / N) \cdot 100$, where n is the number of affected plants, N is the number of assessed plants [9].

The morphological, genetic and agronomically important biochemical characteristics were estimated. The data on green material and seed yield were processed by statistical methods using the "Selekcija" computer software package [8].

At the end of the breeding process the best selected variety is transferred to the state variety testing centre for final evaluation.

Lupine biological productivity and seed yield depend not only on plant genetic characteristics, but also largely on the ecological factors and meteorological conditions during the vegetative growth period. The weather conditions during the experimental years 2001–2003 were favourable for the growth and development of narrow-leaved lupine.

RESULTS AND DISCUSSION

Development of breeding lines. The success of breeding work depends on the abundance and value of the initial material. The initial material from which narrow-leaved breeding lines for green manure 1669, 1679, 1685, 1688 and the variety 'Derliai' were developed through the application of individual selection was obtained from the Russian N. Vavilov crop production institute.

The variety 'Derliai' was produced from the variety 'Deter-3'. The variety 'Deter-3' is of a determinant type, very early, low-yielding, with a low alcaloid content and a low resistance to fungal diseases. The variety 'Derliai' significantly differed in morphological and biochemical properties from the parental variety. This variety is characterised by monopodic branching, high seed and green material yield, high content of alcaloids and high resistance to fungal diseases.

The breeding line 1669 was selected from the variety 'Serebrianskij'. Three genotypes were selected according to phenotypical traits. The blossoms of the parental variety had a light pink colour, the seeds were of sand-colour. The selected genotypes were distinguished by white colour of blossoms and white colour of seed. Both the parental variety and the line 1669 are characterised by a high yield and resistance to fungal diseases.

The breeding line 1679 was selected from the variety DM-15. The selected genotypes differed in blossom and seed colour. The blossom colour of the collection accession DM-15 is light blue and that of seed sandy. The breeding line 1679 is characterised by a dark blue colour of blossoms and a dark sand colour of seed and by a high resistance to anthracnose.

The breeding line 1682 was selected from the variety F-2, which is characterised by a light blue colour of blossoms and a light brown colour of seed. According to the phenotype the selected genotypes differed in the colour of blossoms (dark blue) and in seed colour (dark brown with white dots). Individual genotypes were distinguished by a high resistance to fungal diseases and a short growing season.

The breeding line 1685 was selected from the variety AT-4. The selected genotype is characterised by a sympodic branching, long and narrow pods. A significant difference is small seed, 1000 seed weight is 101 g and that of the variety AT-4 139.4 g.

The breeding line 1688 was selected from the collection accession 3210. The collection number 3210 is characterised by a light blue colour of blossoms and light brown colour of seed. The breeding line 1688 was distinguished for a dark blue colour of blossoms and a bright brown colour of seed. A significant advantage of this breeding number is a high resistance to pod bursting.

The breeding line 1709 was selected from the variety 'Velikan-4'. One very productive (56 pods, 219 seeds), early, fusarium and anthracnose-resistant plant was selected from the collection accessions.

Green material yield. With the increasing demand for ecological agricultural produce, more attention is paid to ecological agriculture which restricts the use of fertilisers, pesticides and herbicides, which makes biological methods of increasing soil productivity most promising. Currently, in the situation of high environmental pollution, legume plants are among those most important ones in the chain of ecological agriculture. The use of green manure on farms results in the accumulation of high contents of organic matter in the soil, improved physical, chemical and biological soil properties and increased crop productivity [4]. The effects of green manure on plants persist for 3–4 years, sometimes even more [7]. Narrow-leaved lupine needs fairly much moisture for growth and development. During the growing season lupine requires the highest contents of moisture from sowing to complete sprouting and from flowering to the whitening of pods; the optimal amount of precipitation is 250 mm. In the wet year of 2003, the highest green material yield was obtained. The yield of the narrow-leaved lupine variety 'Derliai' and of the breeding lines ranged between 65.6–69.7, the standard yield being 71.6 t ha^{-1}. The breeding line N1685 (69.7 t ha^{-1}) lagged behind the standard only insignificantly (Table 1). The averaged experimental data from 2001–2003 suggest that the variety 'Derliai' and the breeding lines lagged behind the standard in terms of green material yield by 2.4–5.4 t ha^{-1}. Our experimental findings show that the reduction in green material yield depends on lupine genetic characteristics and hydrothermal factors. Lupine plant height determines the yield of green material. The height of all the breeding lines and of the variety 'Derliai' ranged between 57.0–58.1 and that of the standard 93.0–95.0 cm. In an excess of moisture the height of the lupine variety 'Snaigiai' can exceed 100 cm. Due to these genetically inherent characteristics the green material yield of the variety is very high.

Ploughing in green material of lupine is recommended when the plants have reached the highest productivity. Nitrogen accumulation in vegetative mass and roots becomes more intensive from the beginning of budding to the shiny pods stage. The variety 'Snaigiai' and the tested breeding lines reach the stage of shiny pods at different time. The breeding lines and the variety 'Derliai' reach this stage, depending on hydrometeorological conditions, in the second ten-day period of July – first ten-day period of August. It is a perfect green manure fallow for

Table 1. **Green material yield of narrow-leaved lupine for green manure, 2001–2003**

Variety, breeding line	2001		2002		2003		Mean t ha^{-1}	Difference from the standard (±) t ha^{-1}
	green material yield t ha^{-1}	difference from the standard (±) t ha^{-1}	green material yield t ha^{-1}	difference from the standard (±) t ha^{-1}	green material yield t ha^{-1}	difference from the standard (±) t ha^{-1}		
'Snaigiai'	60.0	0.0	60.0	0.0	71.6	0.0	63.7	0.0
'Derliai'	56.0	–4.0	55.0	–5.0	68.2	–3.4	59.7	–4.1
1669	56.2	–3.8	58.3	–1.7	67.6	–4.0	60.7	–3.1
1679	58.7	–1.3	56.1	–3.9	65.6	–6.0	60.1	–3.7
1685	57.3	–2.7	57.4	–2.6	69.7	–1.9	61.5	–2.4
1688	54.2	–5.8	53.4	–6.6	67.6	–4.0	58.4	–5.4
1682	–	–	54.4	–5.6	66.0	–5.6	60.2*	–3.5*
1709	–	–	54.1	–5.9	66.3	–5.3	60.2*	–3.5*
LSD_{05}	0.98		0.72		1.3		0.58	

*Data of two years.

winter cereals, while the standard variety reaches this stage 2–3weeks later.

The efficacy of lupine as green manure depends not only on the yield of the incorporated green material but also on its chemical composition. Our experimental evidence indicates that the content of total nitrogen in narrow-leaved lupine at shiny pods stage is higher (3.2–3.7%) than that of yellow lupine (2.3–2.7%). According to chemical composition indicators the tested breeding lines and the variety 'Derliai' are similar to the standard.

Seed yield. Currently, when the occurrence of lupine anthracnose is high in Lithuania, the seed yield is one of the chief criteria for the assessment of breeding material. The world's lupine gene fund does not comprise any varieties that are 100% resistant to fungal or viral lupine diseases, and it is possible that the varieties characterised by partial resistance do not lose this trait longer, and in the years of weak epiphytoty of the disease such varieties either do not catch the disease at all or are only slightly affected [13]. Depending on the growth stage at which the disease appears, lupine anthracnose can destroy all seed yield. The later the plants are affected, the higher the chances to secure at least a small seed yield. The weather conditions during the experimental years were diverse, therefore the spread of fungal diseases of lupine was also different. The highest severity of anthracnose was recorded in 2001. The weather conditions in July 2001 were conducive to the occurrence of anthracnose. The mean air temperature in July was 19.7–21.0 °C, *i.e.* 3.5–4.4 °C higher than the average, the weather was rainy with frequent downpours and squalls. Anthracnose occurred in lupine stands at the beginning of the third ten-day period of July. At the time of anthracnose spread all breeding lines had reached the stage of wax maturity, therefore this fungal disease did not have any marked effect on seed yield (affected plants made up 2.0–2.4%, Table 2), seed yield (1.9–2.6 t ha^{-1}) (Table 3). The variety 'Derliai' and N1669 were distinguished by a high seed yield (2.5–2.6 t ha^{-1}). In the control treatment anthracnose occurred at lupine milk maturity stage. At wax maturity stage all the plants in the control treatment were affected by anthracnose and the seed yield amounted to 0.25 t ha^{-1}. The tested breeding lines matured at the end of the third ten-day period of July, and the standard matured on August 18.

In 2002 and 2003 the weather conditions were more favourable for lupine, and fungal diseases did not do much harm to narrow-leaved lupine. In the year 2002, the first symptoms of anthracnose were recorded at the end of the third ten-day period of June. Cool weather at the end of June – beginning of July inhibited the spread of fungal diseases. The breeding lines reached wax maturity at the beginning of the second ten-day period of July. At the end of maturity, anthracnose-affected plants in the breeding lines

Table 2. **Anthracnose-affected narrow-leaved lupine for green manure (%), 2001–2003**

Variety, breeding line	% of affected plant		
	2001	2002	2003
'Snaigiai'	100	41.0	9.6
'Derliai'	2.1	3.4	1.0
1669	2.0	7.2	0.9
1679	2.0	3.1	1.1
1685	2.2	3.3	1.2
1688	2.4	3.9	1.0
1682	–	2.0*	0.8*
1709	–	5.2*	1.2*

*Data of two years.

Table 3. **Seed yield of narrow-leaved lupine for green manure, 2001–2003**

Variety, breeding line	2001		2002		2003		Mean t ha^{-1}	Difference from the standard (+–) t ha^{-1}
	green material yield t ha^{-1}	difference from the standard (+–) t ha^{-1}	green material yield t ha^{-1}	difference from the standard (+–) t ha^{-1}	green material yield t ha^{-1}	difference from the standard (+–) t ha^{-1}		
'Snaigiai'	0.25	0.0	0.8	0.0	1.1	0.0	0.8	0.0
'Derliai'	2.5	+2.25	2.3	+1.50	2.6	+1.50	2.5	+1.70
1669	2.6	+2.35	2.2	+1.40	2.3	+1.20	2.4	+1.60
1679	2.2	+1.95	2.4	+1.60	2.4	+1.30	2.3	+1.50
1685	1.9	+1.65	2.5	+1.70	2.4	+1.30	2.3	+1.50
1688	2.3	+2.05	2.6	+1.80	2.5	+1.40	2.5	+1.70
1682	–	–	2.7	+1.90	2.7	+1.60	2.7*	+1.90*
1709	–	–	2.2	+1.40	2.1	+1.00	2.1 *	+1.30*
LSD_{05}	0.24		0.18		0.14		0.11	

*Data of two years.

amounted to 2.0–7.2% and in the standard to 61%. Most severely affected was N1669 (7.2%). The breeding lines matured on July 15–25, N1679 was the earliest to mature on July 15; the standard matured on August 9. In terms of seed yield, the breeding lines and the variety 'Derliai' exceeded the standard variety (0.8 t ha^{-1}) by 275–337%. N1682 was found to be the most productive (2.7 t ha^{-1}).

In 2003, narrow-leaved lupine was least affected by anthracnose. The dry and cold June suppressed the spread of the pathogen. In narrow-leaved lupine the first sporadic anthracnose lesions were recorded at the beginning of the third ten-day period of July when the breeding lines were at wax maturity stage and the standard was at the end of milk maturity stage. The breeding lines matured on August 7–12, the standard on August 19. At the end of maturity, anthracnose-affected plants in the breeding lines amounted to 0.8–1.2%, in the standard 9.6%. In 2003 the highest yield (1.1 t ha^{-1}) of the standard was obtained. The yield of the breeding lines (2.1–2.7 t ha^{-1}) exceeded the standard by 191–245%.

The averaged data from 2001–2003 suggest that all the breeding lines exhibited a rapid growth rate in all developmental stages, which determined a high resistance of the breeding lines to anthracnose and a high seed yield (2.1–2.7 t ha^{-1} *versus* the standard 0.8 tha^{-1}). Due to the short growing season (82–102 days) this lupine species can be successfully grown all over the country without any additional cultivation means.

In 2002, the narrow-leaved green manure lupine variety 'Derliai' was included into the National Plant Variety List.

CONCLUSIONS

1. Since the resumption of narrow-leaved lupine breeding at the LIA's Voke Branch, six breeding lines and the variety 'Derliai' were developed using the individual selection method during the period 1995–2003. In 2002 the variety 'Derliai' was included in the National Plant Variety List.

2. Averaged experimental data suggest that in terms of green material yield the new breeding lines lag behind the standard variety 'Snaigiai' by 2.4–5.4 t ha^{-1}. According to the chemical composition indicators, the breeding lines and the variety 'Derliai' as green material are similar to the standard.

3. All of the narrow-leaved lupine lines are characterised by a rapid growth rate in all development stages, high anthracnose resistance (affected plants 0.8–9.6%, *versus* 9.6–100% in the standard), high seed yield (2.1–2.7 t ha^{-1} *versus* 0,8 t ha^{-1} in the standard), short growing season (82–102 days) (of the standard 100–114 days).

4. It is a valuable material both from the genetic and agronomic points of view. It was developed by an individual selection method and will be used for further breeding work. The most promising lines will be transferred to the official trials.

Received 8 December 2004

References

1. Buivydaitë V. V., Vaièys M., Juodis J. ir kt. Lietuvos dirvoþemiø klasifikacija. Vilnius: Lietuvos mokslas, 2001. 358 p.
2. Kurlovich B. S. Lupins. St. Petersburg, 2002. P. 288–289.
3. Lauko augalø selekcija Lietuvoje / Sudaryt. Lazauskas J., Dapkus R./ Vilnius, 1992. P. 100–105.
4. Lazauskas J. Þemdirbys ir gamtosauga. Vilnius, 1995. P. 32–34.
5. Lupin descriptors. IBPGRI. Rome, 1981. P. 1–29.
6. Maknickienë Z. Genotipe effect on seed yield of lupine *Lupinus luteus* L., *Lupinus angustifolius* L. and resistance to fungal diseases (*Colletotrichtum lindemuthianum* Br. et Cav., *Fusarium oxysporum* Schl.) // Biologija. 2001. Nr. 3. P. 27–29.
7. Nedzinskas A. Tarpiniø augalø auginimo velëniniame jauriniame lengvame dirvoþemyje mokslinis pagrindimas: habilitacinio darbo santrauka. Dotnuva, 1995. P. 86–87.
8. Tarakanovas P. Statistiniø duomenø apdorojimo programø paketas „Selekcija". Akademija, 1999. 57 p.
9. Þemës ûkio augalø kenkëjai, ligos ir jø apskaita. Lietuvos þemdirbystës institutas, 2002. 14 p.
10. Äîðîæêèí Í. À., ×åêàëèíñêàÿ Í. È., Íèòèåâñêàÿ Â. È. Áîëåçíè áîáîâûõ êóëüòóð â ÁÑÑÐ. Ì è íñê, 1978. 94 ñ.
11. Èâàíþê Â. Ã., Åâñèêîâ Ä. Î. Àíòðàêíîç ëþïèíà â Áåëîðóññèè // Çàùèòà è êàðàíòèí ðàñòåíèé. 2001. Nº 8. Ñ. 16–18.
12. Åâñèêîâ Ä. Î., Ñòàðîñòèíà Ì. À., Èâàíþê Â. Ã. Âðåäîíîñíîñòü àíòðàêíîçà íà ëþïèíå æåëòîì // Ì åæäóíàð. àãðàð. æóðíàë. 1999. Nº 12. Ñ. 16–19.
13. Êèñèëåâ Í. È., Ñòåïàíîâà Ñ. È. Ôóíãèöèîíàëüíûé îáðàçû ëþïèíà êîëëåêöèè ÂÈÐ // Íàó÷íî-òåõíè÷åñêèé áþëëåòåíü. Nº 139. Ëåíèíãðàä, 1984. Ñ. 66–68.
14. Êîòîâà Â. Â., Öâåòêîâà Í. À., Ñèìî À. Ì. Àíòðàêíîç ëþïèíà // Çàùèòà ðàñòåíèé îò âðåäèòåëåé è áîëåçíåé. Ñàíêò-Ïåòåðáóðã, 1994. C. 64–70.
15. Ì åæäóíàðîäíûé êëàññèôèêàòîð ÑÝÂ ðîäà *Lupinus* L. Leningrad, 1985. C. 8–38.

Zita Maknickienë

INDIVIDINËS ATRANKOS METODO EFEKTYVUMAS KURIANT NAUJAS SIAURALAPIØ SIDERACINIØ LUBINØ VEISLES

Santrauka

Individinës atrankos metodas siauralapiø lubinø selekcijoje Lietuvos þemdirbystës instituto Vokës filiale pradëtas taikyti nuo 1993 m. ásigijus kolekcijà ið Rusijos N. Vavilovo auga-

lininkystės instituto. Ðiuo metodu 1995–2003 m. sukurtos dvi siauralapiø lubinø veislės: tai siauralapiø sideraciniø lubinø veislė 'Derliai' ir siauralapiø paðariniø lubinø veislė 'Vilniai'. 1995–2003 m. sukurtos ne tik minëtos veislės, bet ir 6 siauralapiø sideraciniø lubinø selekcinës linijos, kurios praëjo visus selekcinio proceso etapus ir yra ávertintos pagal tarptautinius reikalavimus. Visos 6 selekcinës linijos pasiþymi dideliu atsparumu grybinëms ligoms, sparëiu augimo tempu visuose augimo tarpsniuose, dideliu sëklø derliumi (2,1–2,7 t ha^{-1}), trumpu vegetacijos periodu (82–102 dienos). Tai vertinga genetiniu-selekciniu, ûkiniu poþiûriu medþiaga, kuri bus naudojama tolimesniame selekciniame darbe, o vertingiausios linijos bus perduotos á valstybinius veisliø tyrimus.

Raktaþodþiai: siauralapiai sideraciniai lubinai, individinë atranka, veislë, atsparumas grybinëms ligoms

Çèòà Ìàêíèöêàíà

ÝÔÔÅÊÒÈÂÍÎÑÒÜ ÈÍÄÈÂÈÄÓÀËÜÍÎÃÎ ÎÒÁÎÐÀ Â ÑÎÇÄÀÍÈÈ ÍÎÂÛÕ ÑÎÐÒÎÂ ÑÈÄÅÐÀËÜÍÎÃÎ ÓÇÊÎËÈÑÒÍÎÃÎ ËÞ ÏÈÍÀ

Ðåçþ ìå

Â 1993 ã. â Âîêñêîì ôèëèàëå Ëèòâîñêîãî èíñòèòóòà çåìëåäåëèÿ íà÷àòà ñåëåêöèîííàÿ ðàáîòà ïî óçêîëèñòî÷íîìó ëþïèíó, ãäå áûë ïðèìåíåí ìåòîä èíäèâèäóàëüíîãî îòáîðà. Äëÿ ñîçäàíèÿ íîâîãî èñõîäíîãî ìàòåðèàëà èñïîëüçîâàëèñü êîëëåêöèÿ ÂÈÐ. Ìåòîäîì èíäèâèäóàëüíîãî îòáîðà â 1995–2003 ã. ñîçäàíî 2 ñîðòà óçêîëèñòî÷íîãî ëþïèíà: ñèíåãðàíûé ñîðò 'Äåðæý' è êîðìîâîé ñîðò 'Âèëíÿé'. Â òå÷åíèå 1995–2003 ãã. ñîçäàíî 6 ñåëåêöèîííûõ ëèíèé óçêîëèñòî÷íîãî ëþïèíà ñèíåãðàíûé òèïà. Ñîçäàííûå ëèíèè óñïåøíî ïðîøëè ãëàâíûå ñåëåêöèîííûå ýòàïû è îöåíåíû ïî ìåæóíàðîäíûì ñòàíäàðòàì. Âñå ñåëåêöèîííûå ëèíèè îòëè÷àþòñÿ âûñîêîé óñòîé÷èâîñòüþ ê ãðèáíûì çàáîëåâàíèÿì, áûñòðûì òåìïîì ðîñòà â âåñåõ ôàçàõ ðàçâèòèÿ, âûñîêîé ñåìåííîé óðîæàéíîñòüþ (2,1–2,7 ò ãà$^{-1}$) è ñêîðîñïåëîñòüþ (82–102 äíÿ). Ñîçäàííûå ñåëåêöèîííûå ëèíèè ÿâëÿþòñÿ öåííûì ãåíåòè÷åñêè ñåëåêöèîííûì ìàòåðèàëîì, êîòîðûé áóäóò ïîðåäàþòñÿ â äàëüíåéøåé ñåëåêöèîííîé ðàáîòå. Âûÿâëåííûå ñàìûå öåííûå ñåëåêöèîííûå ëèíèè áóäóò ïåðåäàíû â ãîñóäàðñòâåííûå ñîðòîèñïûòàíèÿ.

Êëþ÷åâûå ñëîâà: ñèäåðàëüíûé óçêîëèñòûé ëþïèí, èíäèâèäóàëüíûé îòáîð, ñîðò, óñòîé÷èâîñòü ê ãðèáíûì çàáîëåâàíèÿì