PRELIMINARY OBSERVATIONS ON WHITE LUPINE AT MADRAS AND REDMOND, OREGON, IN 1986

J. Loren Nelson[1]

ABSTRACT

Kiev Mutant, Ultra, and five selections (Nutriseed lines 4801, 4805, 5801, 5803, and 5805) of white lupine (Lupinus albus L.) were observed for adaptation in non-replicated single-row plots at Madras and Redmond in 1986. Both trials were planted April 25 and irrigated as needed throughout the summer. The two cultivars and 4801 at both locations, 4805 at Madras, and 5801 at Redmond exhibited the greatest rapidity of emergence and seedling vigor.

Lines 4801, 5801, and 5805 bloomed about one week before other lines and varieties. Pods were non-shattering on erect plants. Seeds were mature and ready for harvest on most plants of each line and variety by September 12. Lines 4801 and 4805 compared favorably with Ultra for seed yield and yield components on an individual plant basis. From a limited plant sample, lines 5801, 5803, and 5805 produced more seed than Ultra. Seed yields need to be determined in multiple row plots with interplant competition which is planned for 1987.

INTRODUCTION

Interest in sweet or low-alkaloid white lupine (Lupinus albus L.) seed for livestock feed has developed recently in the United States. The new varieties and experimental lines of this type of erect legume have large, flat, creamy white seeds with approximately 32-40 percent protein. They can be ground and fed directly to livestock without any detoxification treatment. Therefore, if this lupine is adapted and productive economically in central Oregon, our livestock producers may benefit from a local source of a high protein feed. For this reason, preliminary adaptation trials were initiated in 1986.

---

1 Research Agronomist, Oregon State University, Central Oregon Experiment Station, P.O. Box 246, Redmond, OR 97756.
ACKNOWLEDGMENTS: Seed of Kiev Mutant and Ultra were supplied by Dan Bruce, B-N-P Lentil Company, P.O. Box 146, Farmington, WA 99128. Seed of the Nutriseed lines were supplied by Dr. Kevin McVeigh, International Seeds, Inc., P.O. Box 168, Halsey, OR 97348.

MATERIALS AND METHODS

Rhizobia inoculated white lupine seed (cv. Kiev Mutant, Ultra, and Nutriseed lines 4801, 4805, 5801, 5803, and 5805) were planted April 25, 1986, in single-row, non-replicated 20-foot long plots in nurseries at Madras and Redmond. Two hundred and forty seeds of each entry were sown one-half inch deep with one inch between seeds and about two inches to the side and above a band of liquid 10-34-0 fertilizer applied at 140 pounds per acre. All plots were irrigated as needed. One-hundred seed weight of seed planted, rapidity of seedling emergence and vigor, date of flowering, and time of maturity were noted for all entries. Plants were pulled, bagged, and stored on September 12 and October 8. Plant height was measured when plants were taken from the field. In December, individual plant data were collected and for each variety and line an average value was calculated for the traits shown in Table 1.

RESULTS AND DISCUSSION

Madras Trial

Nutriseed 5805 and Ultra had the largest and smallest seed, respectively (Table 1). The other Nutriseed lines had intermediate seed sizes. One objective for sweet lupine improvement has been to increase the seed size. There may be difficulty with seed breakage of the large seeded lupines during planting with a conventional grain drill. Growers need to be aware of this potential problem.

Seedlings began to emerge about 10 days after planting. The poorly drained soil had crusted severely which appeared to present problems in obtaining a good stage. In white lupine the cotyledons emerge above the soil surface so during the emergence process there were large soil cracks and the seedlings actually lifted large sections (two-four inches in diameter) of soil. The largest seeded lines appeared to accelerate this problem. Ultra, Kiev Mutant, 4801, and 4805 exhibited the fastest emergence the first two weeks after planting. However there were more seedlings with superior vigor of the two varieties than any of the lines three weeks after planting. The first compound leaf was expanding on plants of each variety. There were only a few weak seedlings for lines 5803 and 5805 at this time but several more seedlings emerged later. After 21 days, plants of lines 4801, 4805, and 5801 were similar in vigor and stage of development as variety plants but there were only about one-half the number of plants. No laboratory germination values were available from any variety or line but differences as indicated

existed among varieties and lines for field germination/ emergence. Generally it was very poor. There was some death of seedlings in all entries from root rotting. However, there was less in 4801 and 4805 but by June 27 many plants of 4801 exhibited wilt, leaf yellowing, and death. Root rot and stem vascular browning were prevalent. No identification of disease organism was made. Other lines did not show these symptoms. No root maggots, like those observed on seedlings at Redmond, were found. Poor soil drainage was probably a contributing factor to the death of many plants. By harvest time there were no plants of Kiev Mutant remaining, however, some of them were probably lost when the plot was weeded. The number of plants harvested reflect losses from low germination and poor emergence, disease, and mechanical damage (Table 2). Some plant samples were destroyed in storage by mice.

On June 12, flowering began on line 5805 with blossoms about to open on two 5801 plants. The first flower cluster (raceme) occurred on either node 12 or 13. On June 17, there were blossoms on six, five, and four plants of lines 4801, 5801, and 5805, respectively. No flowers were open at this time on other lines or varieties which were judged to be at least a week later. Flowers open from the base to the apex of each raceme with subsequently later maturation. A number of pod-bearing branches also formed on most all plants of each variety/line which produced predominantly one raceme per branch. An average of 3.4 to 6.8 branches occurred on Ultra and the lines (Table 2). The pods developed slowly. They became large, fleshy, and green then turned yellow. The earliest pods started to dry-down the first part of August. Most pods were sufficiently dry and mature for harvest on Ultra and all lines by the first week of September. Withdrawal of irrigation water at the proper time may be useful to aid seed maturation and pod/plant drying to advance harvest. No attempt was made to do this on the trial.

The data from a few individually spaced plants as shown in Table 2 have limited applicability to plant productivity in large fields of a dense population but the relative values shown indicate a possible potential, for example, lines 5801, 5803, and 5805. Therefore, replicated multiple-row plots of a few varieties/ lines are planned at Madras and Powell Butte in 1987 provided there are sufficient resources.

Redmond Trial

Seedlings of Kiev Mutant, Ultra, 4801, and 5801 started to emerge about two weeks after planting, four-five days later than seedlings of the varieties and 4801 at Madras. There appeared to be less difficulty for seedlings to emerge because of the light sandy soil and no surface crust. Generally, better stands were obtained than at Madras, however, the seed-corn maggot destroyed many seedlings which seemed to be the

only cause of plant loss. Ground squirrels ate all the seedlings of line 4805 and most seedlings of 4801 before the two-strand New Zealand electric fence was installed on June 2 after which no other plants were lost.

Cone-shaped racemes had developed on the largest plants of 5801 and 5805 by June 9 and flowers began to open three days later. Plants of 4801 began to blossom on June 16. Several flowers were open on Kiev Mutant by June 17 but none were visible on Ultra. Plants of 5803 started to bloom June 18 before open flowers could be seen on any Ultra plants.

Thrip damage (disfigured leaves and flowers), leafhoppers, and lygus bugs were observed on plants June 24 with Glen Fisher, OSU Extension entomologist. The seriousness of thrips or lygus bugs on these plants is not known nor is information available on damage caused that may exceed the economic injury level on commercial size fields.

Pods/seed on all remaining plants of varieties and lines were sufficiently dry for harvest about September 20, nearly a week later than the same varieties/lines at Madras. No pod shatter nor lodged plants occurred. Mice destroyed many pods and ate nearly all of the seed from all samples while in storage so no data such as that in Table 2 were collected on Redmond plants. Nevertheless, there were more plants removed from the plots and they appeared to be more productive than those grown at Madras.

From limited observations, it appears that seed of white lupine will mature in central Oregon. However, production would probably be best on non-crusting, well-drained soils. It is suggested that growers experiment with only a few acres if a market can be identified for use of the seed.

Table 1. One-hundred seed weight of Kiev Mutant, Ultra, and five Nutriseed lines planted at Madras and Redmond, Oregon, 1986 compared to seed produced at Madras

Variety/line	100 Seed wt. (gms) from Seed planted	Seed produced
Kiev Mutant	32.1	----[a]
Ultra	27.9	26.7
Nutriseed No. 4801	43.2	36.3
Nutriseed No. 4805	41.8	34.7
Nutriseed No. 5801	46.0	34.3
Nutriseed No. 5803	42.8	30.1
Nutriseed No. 5805	53.5	45.7

[a] No plants were available at harvest for seed data

Table 2. Performance of white lupines at Madras, Oregon, 1986

Variety/selection	Plants harvested	Avg. plant ht.	Avg. pod bearing branches	Avg. pods/ plant	Avg. pods/ raceme	Range avg. pods/ raceme	Avg. seeds/ pod	Range avg. seeds/ pod	100 seed wt.	Avg. seed wt./ plant
	---no.---	-in.-	----------no.----------						----gms----	
Ultra	11	11.6	4.3	10.7	3.2	1-7	2.8	1-6	26.7	8.8
Nutriseed No. 4801	9	13.5	3.4	5.6	1.7	1-3	3.2	1-4.5	36.3	7.9
Nutriseed No. 4805	48	19.7	4.3	7.5	4.0	1-7	3.0	1-5.3	34.7	7.7
Nutriseed No. 5801	9	17.7	6.8	17.6	1.9	1-7	3.1	1-7	34.3	18.5
Nutriseed No. 5803	4	14.6	5.8	17.6	3.1	1-8	2.8	1-4.8	30.1	15.0
Nutriseed No. 5805	3[a]	19.6	5.3	9.0	2.3	1-3	3.4	1-4.5	45.7	23.3

[a] All measurements except for average plant height and pod-bearing branches were from a single plant because of mouse damage to pods and seeds on the other two plants