

STUDY ABOUT VARIABILITY OF *Lathyrus tuberosus* L. FRUITS AND BEANS

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Abstract

Being a common weed *L. tuberosus* experienced a growing spread in agriculture white luvisols from southern territory. The cause is the best its adaptability to the existing conditions. The studies of its variability may bring some new information on how the adaptation has occurred, as well as highlighting some new features of the fruits and beans of this species. Racemous fruits has lengths between 9 and 20 cm, with a higher frequency to 12-14 cm. Number of pods of racemous fruit was between 1 and 6, predominantly by 2-3 pods. Pods length was between 2.2 and 3.6 cm, with the higher percentage between 2.8 and 3.0 cm. Pod width was between 3.5 and 5.2 mm, with greater frequency from 4.4-4.6 mm. Number beans in a pod varied between 0.5 and 4.1, with higher frequency of 1.8-2.1. Chickling grain length was between 3.5 and 5.2 mm, 4.1-4.3 mm high frequency. Thickness between 2.8-3.9 mm grain was, and the dominant were between 3.0-3.3 mm.

Key words: *Lathyrus tuberosus*, racemous fruit, pods, beans.

INTRODUCTION

One of the common weeds in agriculture is the sweet pea *Lathyrus tuberosus* L. (Bayer code: LATTU) (Anghel et al., 1975). Being Eurasian origin, species prefer edge of fields planted with winter cereals, orchards and hay crops (Krähmer, 2014). With its tendrils weed is able to climb and flourish over the cereals, or may cover horticultural species. In meadows formed bushes easily observed. As feed *L. tuberosus* is considered a plant worthless. Fruits, especially grains contains various alkaloids and therefore are considered toxic. Instead of the root tubers are recommended in food (Bianco, 2001), as raw or prepared (Chirilă, 2001).

In July the plant blooms and flowers with red-purple petals are grouped into broad racemous inflorescences. Pods fruit are obvious, cylindrical- slightly flattened, without hairs (Bărbulescu, 1988). Beans that are spherical-less sharp form, 3-6 mm in diameter, weighing 2.4-2.5 g/100 seeds. Hilum grain is small, characteristic.

Of course these are general morphological characteristics, but by taking measurements

under different vegetation, might bring some new elements to describe this common weed species in agriculture. Ripening pods and beans held in August. In the present study we analyzed the final phase: the length of the racemous fruits, the number of pods from an inflorescence, weight, length and thickness of pods, the number and weight of grains from racemous fruits. Grains were determined length, thickness and absolute weight.

MATERIAL AND METHODS

Measurements were conducted during the month of August 2014 on *L. tuberosus* mature plants. Plants were chosen from the edge surfaces that have been grown and harvested winter wheat. Crops were located on the highest plateau (330 m) of the station. Were randomly selected 100 *L. tuberosus* plants harvested from which only one racemous in the central portion of the shoots. The 100 fruits were measured and determined: the length (in the place of attachment to the top) and the number and weight of pods formed. Husks, one of the central portion of the racemous, were

measured by three characters: the length, width and weight. Total grains and weight of a raceme were recorded later. From grains formed in a raceme was chosen nonselective one, which was measured length and thickness. Total grains in a raceme were fixed and absolute weight (the weight of a thousand grains- TGW).

Morphological characters measured were then analyzed by drawing frequency polygons (FP %) or histograms. For most measurements have been used in class intervals, and only when the number of pods of a racemic fruit, absolute values were used. The study in this species histograms revealed the following:

- Modal values (highest frequency);
- Limits the diversity of characters ranged studied;
- The specific of each character of the area analyzed plant ecotype.

Between characters analyzed were established some correlations with which have been observed and their trends within ecotype

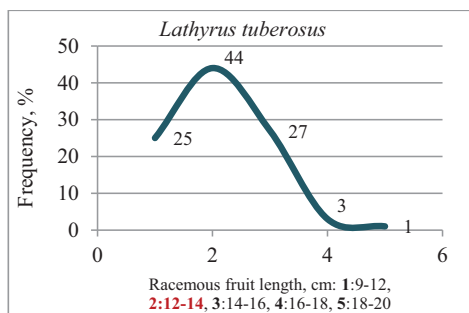


Figure 1. The frequency of fruits length, *L. tuberosus* weed. Photo: racemious fruit in full bloom (1:9-12, 2:12-14, 3:14-16, 4:16-18, 5:18-20, cm)

The limits of variation of this character were between 9 and 20 cm. Shorter fruits (9-12 cm) had a frequency of 25%, while the long (16-18 cm and 18-20 cm) were rare (3% and 1%). Number of pods per fruit was formed between 1 and 6. The modal value shows that the highest frequency had a fruit with two pods-30%, followed by the 3 pods (28%) and then those with 4 pods (26%). Fruits with one single pod were only 2% of the total, while those with 5 and 6 pods, in 10% and 4% respectively. After counting, pods per racemous were weighed. The limits within which their weight

studied. The expression values were made using Excel and analysis of variance (the rows of variation). Statistical parameters were calculated using the formulas:

- $\bar{a} = \frac{\sum x}{n}$, \bar{a} = media, and x = values ;
- S^2 (variance) = $\frac{1}{n-1} \left[\sum x^2 - \frac{(\sum x)^2}{n} \right]$;
- S (standard error) = $\sqrt{S^2}$;
- $S\%$ (variation coefficient) = $\frac{S}{\bar{a}} \cdot 100$.

RESULTS AND DISCUSSIONS

Variability of *L. tuberosus* fruits. Racemous form a loose the plant that grows from 3 to 6 flowers. After fertilization are formed pods, with which to configure the final appearance of the fruit racemous (Prodan & Buia, 1958). By measuring the length of racemous at the top grip to have found some differing values (Figure 1). The modal value was at maximum length of 12-14 cm (44%).



has fluctuated were between 0.12 g and 0.75 g. Among a number of pods and weight of fruit established a positive correlation (Figure 2). The correlation coefficient ($r = 0.742^{***}$) is very significant statistical assurance, demonstrating that plant *L. tuberosus* forming more inflorescences, these will be heavier. Pods dimensions refer to the length and the thickness that they had. Long- pods form is the spear, almost cylindrical, glabrous nerves and reticulation. The modal value of the length of the pods was 2.8-3.0 cm (51%) (Figure 3).

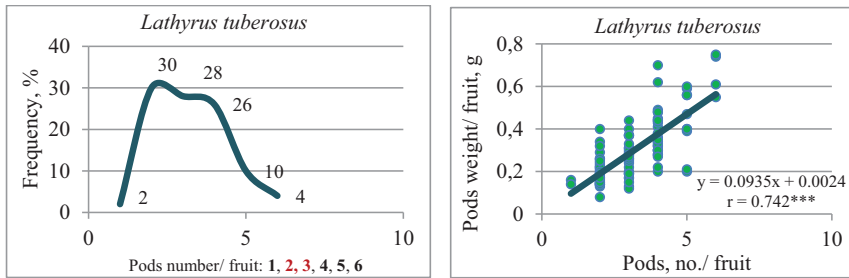


Figure 2. The frequency of pods number and correlation between the number and pods weight

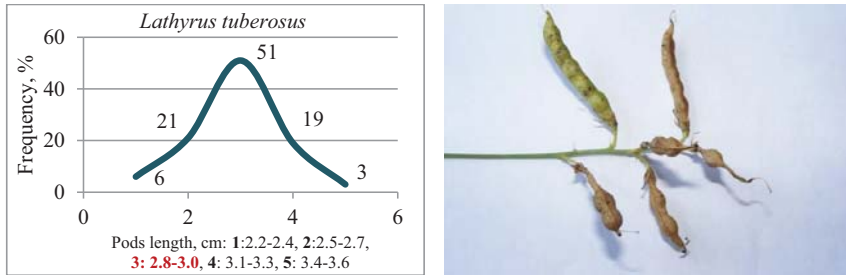


Figure 3. The frequency of pods length; Photo: a racemous fruit with 6 pods

Lengths of 2.5-2.7 cm and 3.1-3.3 cm of pods were close and specific frequencies of 21% and 19%. 2.2-2.4 cm long pods were frequency of 6%, while those with 3.4-3.6 cm, 3%.

Pods thickness is variable, usually between 4-6 mm (Săvulescu et al., 1957). From the measurements it was found that the modal value was 4.4-4.6 mm (33%) (Figure 4). The limits of variation of the width of pods were

between 3.5 and 5.2 mm. Pods of 4.1-4.3 mm and 4.7-4.9 mm had frequencies of 23% and 25%. Other thickness ranging from 3.7-4.0 mm and 5.0-5.2 mm had frequencies of 7% and 8% respectively. Only pods with 3.5-3.7 mm in thickness accounted for only 4% frequency. Between the length of pods and their thickness was established a positive correlation ($r = 0.214$).

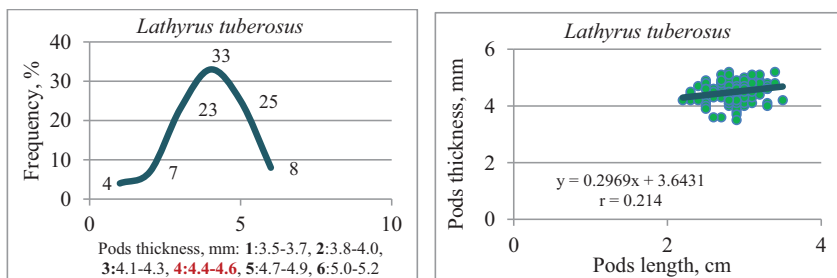


Figure 4. The frequency of pods thickness and correlation between pods length and pods thickness (1:3.5-3.7, 2:3.8-4.0, 3:4.1-4.3, 4:4.4-4.6, 5:4.7-4.9, 6:5.0-5.2, mm)

The number of grains that formed on a raceme fruit varied greatly. Modal value was located at 5-7 grains/ fruit. The limits within which they varied were between 3 and 19. Number between 3 and 10 was major - 92%, and between 11 and 19 were below 10% (Figure 5).

Between the number of grains of racemous and weight achieved a highly significant correlation ($r = 0.922^{***}$). This means that as the plant has conditions to form fruit with several seeds, they will be heavier.

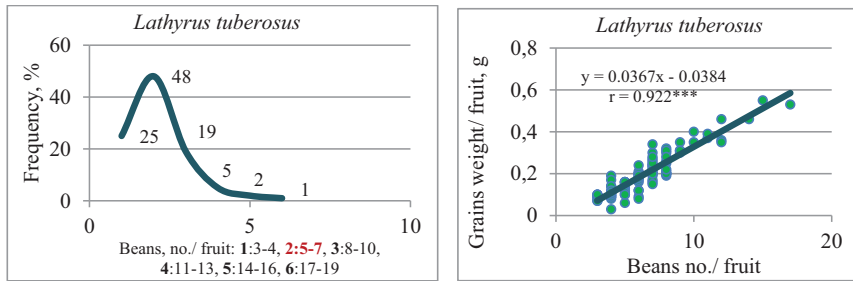


Figure 5. The frequency of grains number and correlation between grains number and grains weight (1:3-4, **2:5-7**, 3:8-10, 4:11-13, 5:14-16, 6:17-19)

Variability of *L.tuberosus* beans. Grains are formed in the pods may vary between 3 and 6, which are spherical in shape, slightly angular, and warty. Determinations of the number of beans in a pod showed variability rather big (Figure 6). Modal value shows the number between 1.8 and 2.1 grains/pod (34%). Limits the average number fluctuated between 0.5 and 4.1. Less than 10% frequency in number of grains were 0.6-1.3 and 2.6-4.1. *L. tuberosus* grain sizes are between 5-6 mm long, with oval hilum, short and rather small. Grain analysis was done both by measuring the length and thickness of their beans. The grain length had modal value between 4.1 and 4.3 mm (Figure 7).

Grain length limits were between 3.5 and 5.2 mm. Frequencies of grain length of 22% were obtained both in length of 3.8-4.0 mm and of 4.7-4.9 mm. Grains 3.5-3.7 mm long and 5.0-5.2 mm represented only 2% and 8% respectively.

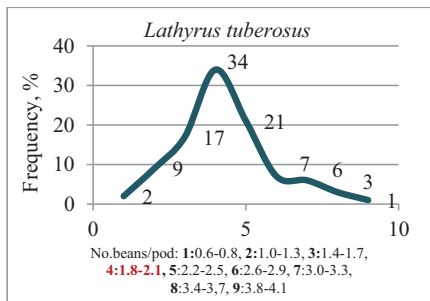


Figure 6. The frequency of bean number from pod (1:0.5-0.8, 2:1.0-1.3, 3:1.4-1.7, **4:1.8-2.1**, 5:2.2-2.5, 6:2.6-2.9, 7:3.0-3.3, 8:3.4-3.7, 9:3.8-4.1)

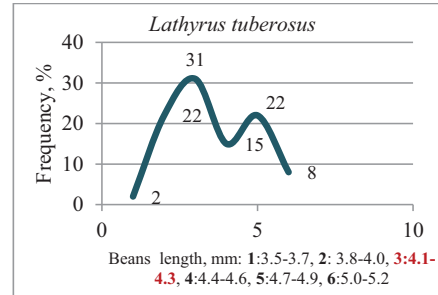


Figure 7. The frequency of bean length (1:3.5-3.7, 2:3.8-4.0, **3:4.1-4.3**, 4:4.4-4.6, 5:4.7-4.9, 6:5.0-5.2, mm)

Grain thickness was specific variability. Modal value of the thickness was 3.0-3.1 mm (29%) and very close to it in the 3.2-3.3 mm (28%). The beans were thick, so their frequency reduced more and more. Between the length and thickness of *L. tuberosus* grains established a positive correlation, slightly increasing ($r = 0.282$) (Figure 8).

Absolute mass of grains showed a fairly high variability. Modal value stood at 30-35 grams (30%), and limits were between 5 and 50 g. About 80% of beans were weighed between 20 and 40 g (Figure 9). Correlations obtained between grain weight and dimensions themselves- absolute length and thickness were positive. The relationship between thousand grain weight- TGW, and the length grain was close ($r = 0.436***$), while correlation between the TGW and the thickness of the grains was less labile ($r = 0.208^*$) (Figure 10).

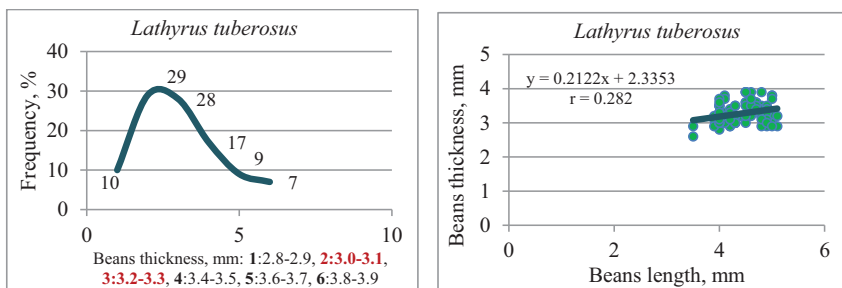


Figure 8. The frequency of grains thickness and correlation between grains length and grains thickness (1:2.8-2.9, **2:3.0-3.1**, **3:3.2-3.3**, 4:3.4-3.5, 5:3.6-3.7, 6:3.8-3.9, mm)

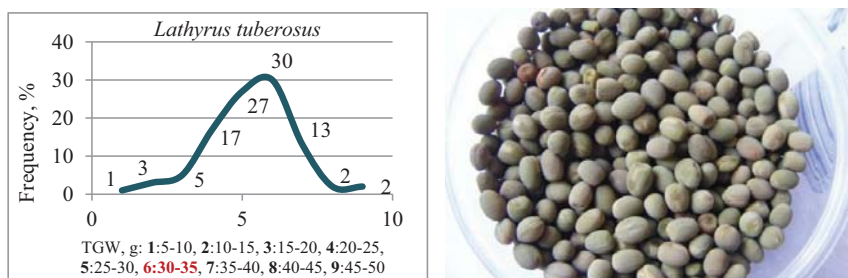


Figure 9. The frequency of beans weight expressed by TGW, *L. tuberosus* weed (1:5-10, 2:10-15, 3:15-20, 4:20-25, 5:25-30, **6:30-35**, 7:35-40, 8:40-45, 9:45-50)

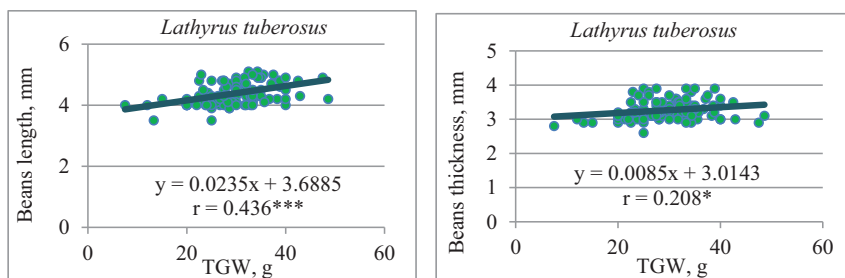


Figure 10. Correlations between TGW and beans dimensions: length and thickness

Other aspects of variability in *L. tuberosus* fruit and grains.

To better characterize the analyzed parameters were calculated a series of statistical indices- table 1 and 2.

From the average of the racemous fruits shows that had a length of 13 cm, number of pods in fruit was 3, pods of racemous weight was 0.3 g, pod length was about 3 cm, with a thickness of 4.5 mm. The number of grains of fruit was 6.5, and the weight thereof was 0.20 g. The beans were the average of the pod 2, a length of 4.4 mm, a thickness of 3.3 mm and TGW of about 30 g.

CONCLUSIONS

A common species which is lately spread is *L. tuberosus*. Variability study aimed reproductive parts: fruits and beans of species. Characters findings revealed weed ecotype adapted white luvisoil of station (Table 3).

Table 1. Statistic indices of *Lathyrus tuberosus*: a-fruits

Indices	Multiple racemous fruits						
	Racemous fruit length, cm	Pods number/ fruit	Pods weight/ fruit, g	Pods length, cm	Pods width, mm	Beans number/ fruit	Beans weight/ fruit, g
Average, \bar{a}	13.23	3.24	0.31	2.86	4.49	6.48	0.20
Variance, s^2	2.5280	1.3560	0.0215	0.0702	0.1356	7.0602	0.0112
Standard deviation, s	1.5900	1.1645	0.1467	0.2650	0.3682	2.6571	0.1056
Coef. of variation, s%	12.02	35.94	48.02	9.26	8.20	41.00	53.01

Table 2. Statistic indices of *Lathyrus tuberosus*: b- beans- grains

Indices	Beans, grains			
	No./ pod	Length, mm	Width, mm	TGW, g
Average, \bar{a}	2.07	4.39	3.27	29.90
Variance, s^2	0.3620	0.00014	0.0818	49.6288
Standard deviation, s	0.6017	0.0120	0.2861	7.0448
Coef. Of variation, s%	29.27	0.27	8.76	23.56

Table 3. The structure and distribution of analysis values from *Lathyrus tuberosus* fruits and grains

Racemous fruit length cm, %	The pods variability				The beans/ grains variability			
	No. per fruit, %	Length, cm %	Width mm %		No. per pod, %	No. per fruit, %	Length, mm %	Width, mm %
9-12 25%	1 2%	2.2-2.4 6%	3.5-3.7 4%		0.5-0.8 2%	3-4 25%	3.5-3.7 2%	2.8-2.9 10%
12-14 44%	2 30%	2.5-2.7 21%	3.8-4.0 7%		1.0-1.3 9%	5-7 48%	3.8-4.0 22%	3.0-3.1 29%
14-16 27%	3 28%	2.8-3.0 51%	4.1-4.3 23%		1.4-1.7 17%	8-10 19%	4.1-4.3 31%	3.2-3.3 28%
16-18 3%	4 26%	3.1-3.3 19%	4.4-4.6 33%		1.8-2.1 34%	11-13 5%	4.4-4.6 15%	3.4-3.5 17%
18-20 1%	5 10%	3.4-3.6 3%	4.7-4.9 25%		2.2-2.5 21%	14-16 2%	4.7-4.9 22%	3.6-3.7 9%
	6 4%		5.0-5.2 8%		2.6-2.9 7%	17-19 1%	5.0-5.2 8%	3.8-3.9 7%
					3.0-3.3 6%			
					3.4-3.7 3%			
					3.8-4.1 1%			

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