EFFECT OF DIFFERENT FERTILIZERS TYPES ON FLAX FIBRES CHARACTERISTICS IN DIFFERENT CULTIVARS OF FLAX

Dervišević Selma, Veladžić Mirsad, Jogić Vildana

University of Bihac
Biotechnical Faculty

Abstract

This work presents the results of research on the impact of organic, minerals, organic and microbiological fertilizers on characteristics of flax fibers in three different varieties of flax. The experiment was performed in the municipality of Bosanska Krupa in 2012. The parcel was set up in randomized block of design with four replications, and the size of the assessment parcel was 10 m^2. All three varieties are sown on the basis of 1000 germinable seeds per m^2. They represented two foreign sorts: Michael, Belstar and domestic sort X. In the autumn mineral fertilizers were entered in soil in the scale of NPK = 15:15:15, 250 g/20m^2, 3 kg/20m^2 of manure and 10 l/ha of microbiological fertilizers "Azoter". The different combinations of fertilizers were used: organic fertilizer, microbiological fertilizer, organic+microbiological fertilizer and control (without fertilization) - for each tested sort. The research was a multi-factorial (cultivar and method of fertilization). According to the results obtained during the one-year research, Michael and Belstar varieties have achieved the best results with organic+bacteriological fertilizer. Fibers got out of Michael and Belstar variety have better quality, they are longer and harder, which makes them suitable for use in technical textiles where even coarser fibres get more important. X sort fibres are the shortest and the thickest, so they give better results with bacteriological fertilizers.

Keywords: flax, sort, morphological characteristics, phenological characteristics, fiber, fertilizer.

1. Introduction

In addition to the elastic properties of which have, flax fibers are characterized by high strength which reinforces their component (Kocjan & Rijavec, 2010). According to EU guidelines by summer 2012, 95% of all new vehicles must be able to be recycled, which is the recommended use of natural fibers, especially flax. There is increasing interest in the use of flax fibers in the field of technical textiles where the coarse fibers gaining increasing importance of (bio-composites), and therefore hards now considered very valuable component of the insulating material (Šurina et al. 2006 & 2009b).

Length and fineness of the fibers are the most important characteristics that determine the quality and suitability of flax fibers as raw material for the production of textile yarn and fabrics (Butorac et al. 2008). Hann (2005) considers that the wetting stems is most demanding stage in the production of flax fibers, usually it is the natural way, with the help of enzymes produced by microorganisms. Biological process takes 8 to 14 day in cold water, but 3 to 4 days at a temperature of 30 to 40 ° C, with a regular change of the water.

With proper selection of varieties and production technology (eg optimum nitrogen fertilization) and processing would ensure the natural fibers from own production for the textile industry, but also the raw material for other industries with minimal environmental pollution.

2. Materials and Methods

The study was conducted during the vegetation period of 2012. the location of Bosanska Krupa, a sample plot is set in randomized block design with four replications. In the research are used three varieties of flax: Michael, Belstar and variety X and 5 variants od fertilization: T1 - control (without fertilizer application), T2 - mineral fertilizers, T3 - organic fertilization (bovine manure), T4 - bacterial fertilizer (azoter) and T5 - organic+bacterial fertilizer. Applied is a common technology growing of flax. During the vegetation were followed the following features: time of emergence and growth of the plants, while the the harvest of flax carried out in the second half of July. Selected samples of flax are wetted and dried fruits in the river, where the does not have frequent visitors.

After immersion, the stems are washed and dried naturally in daily temperature which was about 35 °C in the period of 10 days. The fibers were separated in the traditional way. Splint was removed with hand-made crusher. Quality control of fiber, was performed in the laboratory Saniteks - Velika Kladuša, and was examined length, thickness, weight and elasticity of the fiber. Length and thickness of the fibers were determined using a micrometer, brand Stoßgeschützt (Germany), the elasticity was determined by dynamometer brand Instron 1026 (USA), while the weight of the fibers was determined with the help of analytical balances. In accordance with the applied research plan, for all the studied traits, was conducted statistical analyzes of variance analysis using the statistical package SPSS version 16.0 trial.

3. Results and Discussion

Attendees were statistically significant differences between the studied varieties for all the characters (table 1-4). For the purposes of textile fiber length and finesse are the most important characteristics that determine the quality of the fiber. It is recommended that the technical stem length be longer than 60 cm (Butorac et al. 2009). During of our research the resulting values were not lower.

By statistical analysis the significance of the results can be concluded that the differences in stem length are conditioned with the variety and method of fertilization.

Table 1. The mean of stem length (cm) in three varieties in relation to the applied fertilizer treatments and Levens' test

stem length				
sort	fertilizer	$\bar{X}$	SD	N
Michael	T1	60,13	5,20	30
	T2	77,00	0,98	30
	T3	68,03	4,50	30
	T4	80,96	2,26	30
	T5	70,63	5,33	30
Belstar	T1	60,23	6,78	30
	T2	65,66	1,47	30
	T3	68,40	1,54	30
	T4	50,43	2,12	30
	T5	72,73	4,57	30
sort X	T1	47,00	4,14	30
	T2	51,63	1,75	30
	T3	45,06	1,11	30
	T4	50,43	1,45	30
	T5	66,53	3,85	30

Leven's test		
	level of significance	F
Michael	0.01	(F(4)=119.776, p< 0.01)
Belstar	0.01	(F(4)=145.578, p<0.01)
Sort X	0.01	(F(4)=279.548, p< 0.01)
between var	0.01	(F(2)=201.85, p=0.000)

Table 2. The mean of fiber length (cm) in three varieties in relation to the applied fertilizer treatments and Levens' test

fiber length				
sort	fertilizer	$\bar{X}$	SD	N
Michael	T1	17,30	2,01	30
	T2	30,36	7,28	30
	T3	24,46	0,41	30
	T4	24,40	4,78	30
	T5	34,20	2,86	30
Belstar	T1	19,30	3,70	30
	T2	25,20	2,77	30
	T3	25,20	3,56	30
	T4	26,42	3,51	30
	T5	25,50	3,35	30
sort X	T1	15,10	1,81	30
	T2	11,60	2,07	30
	T3	18,60	5,41	30
	T4	20,70	4,02	30
	T5	19,60	3,20	30

Leven's test		
	level of significance	F
Michael	0.01	(F(4)=11.791, p=0.000)
Belstar	0.01	(F(4)=3.524, p=0.025)
Sort X	0.01	(F(4)=5.492, p=0.004)
between var	0.01	(F(2)=40.75, p=0.000).

Variety Michael fertilized with T5 has resulted with the longest fibers (34.20 cm), while the shortest fibers were measured at T1. The hypothesis is rejected at the significance level of 0.01 (F (2) = 40.75, P = 0.000). Differences in the length of the fibers are random and sort Michael has significantly longer fibers compared to the other two tested varieties and fertilizer treatments T5 and T4 compared to other treatments. Kocjan and Rijavec (2010) in research conducted in the area of Bijela Krajina reported that the average length of domestic technical textile fiber flax was 19 cm. Based on this can be said that the results of this study agree with the studies mentioned authors, and that the fibers are all tested varieties can be successfully used in textile industry. The fineness of the fibers is primarily related to the thickness, weight and elasticity of the fiber (table 3, 4 and 5).

Table 3. The mean of fibers thickness (μ) in three varieties in relation to the applied fertilizer treatments and Levens' test

fibers thickness				
sort	fertilizer	$\bar{X}$	SD	N
Michael	T1	0,054	0,008	30
	T2	0,042	0,013	30
	T3	0,022	0,008	30
	T4	0,034	0,011	30
	T5	0,028	0,013	30
Belstar	T1	0,030	0,007	30
	T2	0,032	0,010	30
	T3	0,032	0,008	30
	T4	0,032	0,010	30
	T5	0,034	0,008	30
sort X	T1	0,024	0,005	30
	T2	0,020	0,010	30
	T3	0,026	0,008	30
	T4	0,020	0,007	30
	T5	0,012	0,004	30

Leven's test		
	level of significance	F
Michael	0.01	(F(4)=11.791, p=0.000)
Belstar	0.01	(F(4)=3.524, p=0.025)
Sort X	0.01	(F(4)=5.492, p=0.004)
between var.	0.01	(F(2)=40.75, p=0.000).

Statistical analysis of the significance of differences among the varieties and treatments (F(2)=40.75, p=0.000) shows that these differences were significant only at the level of varieties.

Table 4 Mean values of fibers elasticity (cN/dtex), with three varieties in relation to the applied fertilizer treatments and Levens' test

fibers elasticity				
sort	fertilizer	$\bar{X}$	SD	N
Michael	T1	7,50	0,707	30
	T2	9,00	1,414	30
	T3	6,00	0,000	30
	T4	6,00	1,414	30
	T5	10,75	3,889	30
Belstar	T1	10,00	0,000	30
	T2	8,00	0,000	30
	T3	9,00	1,414	30
	T4	9,00	1,414	30
	T5	9,00	1,414	30
sort X	T1	5,50	0,707	30
	T2	6,50	0,707	30
	T3	6,00	0,000	30
	T4	9,00	1,414	30
	T5	7,00	0,000	30

Leven's test		
	level of significance	F
Michael	0.01	-
Belstar	0.01	-
Sort X	0.01	-
between var.	0.05	(F(2)=6.345, p=0.01)

After the statistical analysis, it is evident that the statistical differences are not random H_o is rejected at the significance level of 0.05 and concluded that the variety Michael has elastic fibers in comparison to other tested varieties of flax.

Table 5. Average values of fibers weight (g) in relation to the applied fertilizer treatments

fertilizer	Michael	Belstar	sort X
T1	0,0065	0,0046	0,0025
T2	0,0059	0,0043	0,0029
T3	0,0054	0,0045	0,0034
T4	0,0058	0,0058	0,0039
T5	0,0059	0,0053	0,0021

4. Conclusion

After the research and statistical processing of the obtained data, we can conclude that are present statistically significant differences based on the characteristics of the studied varieties and fertilizer treatments.

The best results were achieved with the fertilization treatment T5 (organic+bacterial fertilizer). Based on the analysis of the length, thickness and elasticity of fibers, very good results were obtained with the cultivar Michael and Belstar, and it can be concluded that these two varieties are intended for the processing. The variety X has the most tender and shortest fibers, and it can be concluded that gives better results with bacteriological fertilization.

Therefore, this work is a contribution to the improvement of fiber flax cultivation and encouragement of this type of cultivation and production in the northwestern part of Bosnia and Herzegovina, and beyond.

5. References

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