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SEED QUALITY OF THE FACELIA-VARIETY NS PRIORA GROWN IN SERBIA

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Abstract

Phacelia has been used for seed production and as a forage crops, either on its own or in a mix with peas or vetch to provide forage and honey production as a source of high quality nectar and pollen. The experiment was carried out in 2016, in the fields of the Institute of Field and Vegetable Crops in Bački Petrovac, in Serbia, with variety NS Priora. NS Priora had plant flowering continualy over 60 days and had high, good quality grain yield. NS Priora variety had average nitrogen content is 3.21%, protein content was 20.06% and the average thousand seeds weight was 1.42 g. Phacelia is presently very intensively used in organic agriculture and for sowing of arable land temporarily excluded from production which achieves high yields.

Keywords: *Phacelia, variety NS Priora, honey plant, seed quality, thousand seeds weight.*

Introduction

Phacelia is annual plant, native to the south western United States and northern Mexico, where it is used as a cover crop and as bee forage. There are about 200 species in the *Phacelia genera*, some perennial and some annual (Cazzola, 1987). As a commercial species *Phacelia tanacetifolia* Bent.has long been recognised by beekeepers as a preferred foraging plant for honeybees (Teittinen, 1980) with a high potential for honey yield (Orsi and Bionoi, 1987). Phacelia has also been used as a green manure crop in Europe for a number of years (Anon, 1989). When ploughed as a green manure, increases carbon and nitrogen content in soil to a depth of over 80 cm (Beckmann, 1977). The crop is also reported to have nematicidal properties (Cazzola, 1987; Anon., 1989; Booker Seeds, 1990) although it was not clear whether this is by means of a damaged crop or whether the root system was actively nematicidal. Phacelia has also been used as a forage crop, either on its own (Danial and Zobelt, 1986) or in a mix with peas or vetch to provide forage and honey production (Petkov, 1966). Phacelia has been found to have high energy and protein content, but some questions were raised about possible allele-chemical properties of the plant (Danial and Zobelt, 1986).
Excess production of basic agricultural plants determines growers to cultivate alternative crops, which become a next source of income and may enrich soil with organic matter as a green fertilizer or to feed animals in the form of mixtures with fodder plants with simultaneous low work expenditure (Brzezowska and Dreszczyk 2009). Tansy phacelia is one of them. It has not been popular up until recently. However, in the recent years slowly but successively it has gained numerous followers. Due to possibility of using it as an intercrop in the agro-environmental program, farmers obtain additional aid from the Agency for Restructuring and Modernisation of Agriculture. The crop itself is great for non-plough cultivation which on account of economics gives a great advantage over other post-crop plants (Leszczyńska, 2012). Tansy phacelia is presently very intensively used in organic agriculture

and for sowing of arable land temporarily excluded from production (Ramenda, 2003, Popovic et al, 2016, 2017a, 2017b).
Phacelia has been recorded as being a host plant for aphid predators in sugarbeet and wheat. *Syriphidae, Carabids, Coccinellids* and *Chrysopids* (all aphid predators) were all encouraged by the planting of *P. tanacetifolia* (Senegonca and Frings, 1988). Thus there may be some potential as a biological refuge for predatory insects. Phacelia has a long fibrous root system as well as a main tap root. It is claimed to benefit soil structure and also to have nematicidal properties (Cazzola, 1987; Anon., 1989). MAF Technology Lincoln have included Phacelia in trials evaluating the restorative properties of a number of crops (Francis, 1991). However, for seed production in New Zealand, it would seem unwise to sow the crop in depleted, poorly structured soils. The speed of growth of the crop indicates that optimum soil conditions are required. Soil of poor structure and bad compaction has to be avoid, because it may, in fact, create problems with damp seedlings (Krober and Beckrnann, 1975). Problem weeds, observed in the field, were fathen (*Chenopodium album*) and nightshade (*Solanum nigrum*) while wire weed (*Polygonum aviculare*) and willow weed (*Polygonum persicaria*) were seed dressing problems.Limited popularity of this plant depends on a low availability of its seeds on the market which results from difficulty in cultivation and price of seeds. Despite the fact that the plant has low soil, fertilization and climatic requirements, high yield may be obtained only with optimal moisture and thermal conditions. Plants which were negatively affected by weather may characterize with low yield and extension of flowering and seeds maturation. One of the grower's task should consist in maintaining high quality of seeds through their appropriate storage. The issue of the impact of long-term seeds storage on their sowing quality is very significant on account of economy and maintaining high germination ability of the investigated sowing material in the form of a specific species of crop. The indeterminate flowering, coupled with easily shattered pods, present a major harvesting problem with Phacelia.Aim of crop production is to establish uniform plant emergence, reasonably high plant populations and to attempt to compress the flowering as much as possible. The objective is to produce seed of even maturity. Pollination Bees are required for maximum seed set in Phacelia, however the crop is highly attractive to bees. About 2.5 hives per hectare should be provided if there is no bee source nearby (Ponichtera Piotr. 2016). According to Sulewska et al., (2005) during the so called farm storage of seeds, conditions and storage time should be absolutely considered, which affect germination ability, particularly when we plan the use of these seeds as sowing material.
The aim of this study was to examine the quality of seeds NS Priora grown in Serbia.

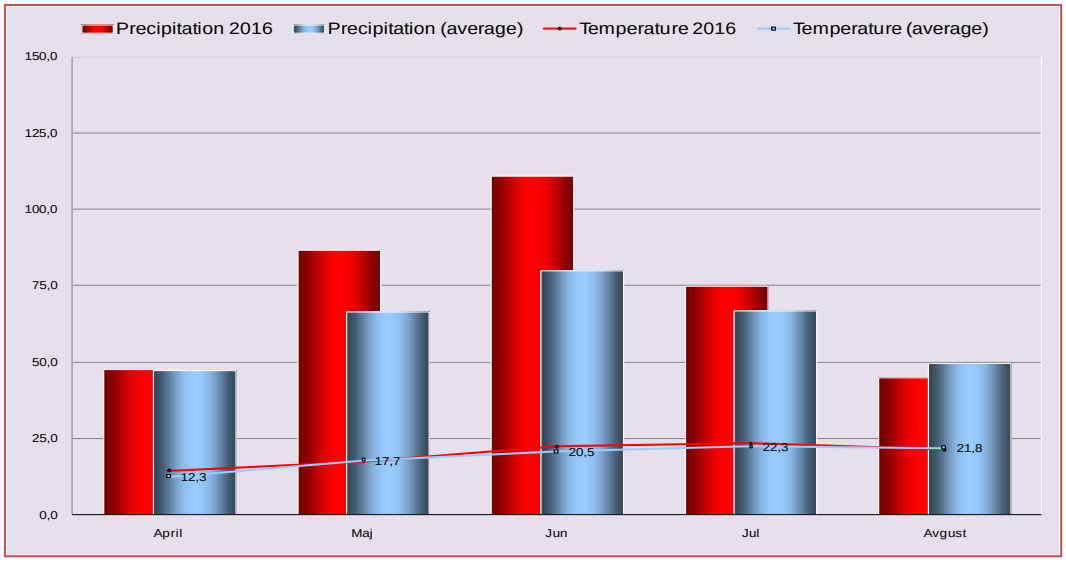
Material and metods

The aim of this study was to examine the quality of new variety NS Priora produced in 2016, the plots of the Institute of Field and Vegetable Crops Backi Petrovac (φN 45 ° 20 'λE 19 ° 40' 89 m.s.l.). The basic plot amounted to 10 m^2 in three replications. The experiment was conducted according to a split plot. Preceding crop was buckwheat. The standard technology for crop cultivation phacelia was applied. Autumn ploughing is carried out to a depth of 25 cm, when the present one 200 kg ha^{-1} of NPK nutrients. Sowing was done in late March 2016 at a depth of 2 cm. The general recommendation was to sow at a depth of 1-2 cm. It is recommended to use 8-10 kg ha^{-1} for phacelia seed sowing. Harvest was carried out at technological maturity of plants (Popović et al., 2016, 2017b). After the harvest, samples from all replicates were measured and quality of the seeds were evaluated.From chemical analysis, nitrogen content and protein content in the grain, were determined, by methods of Kjeldahl, *DM 05.10.03*. The analysis of the experimental data was performed using descriptive statistics

and mediana using the statistical package STATISTICA for Windows 12 and all of the research results are presented in tables and graphs.

Meteorological conditions

Precipitation in 2016 (April-August, 364mm) were higher than for the long-term average 54 mm, while the average temperature was 19.64 °C, Graph. 1.



Graph 1. Precipitation and temperature in Bački Petrovac, 2016

In the vegetation period 2016 were observed abundant rainfall, and that in May 86.6 mm, 110.9 mm in June, July, 75 mm, 44.8 mm and in August, graph. 1.

Results and Discussion

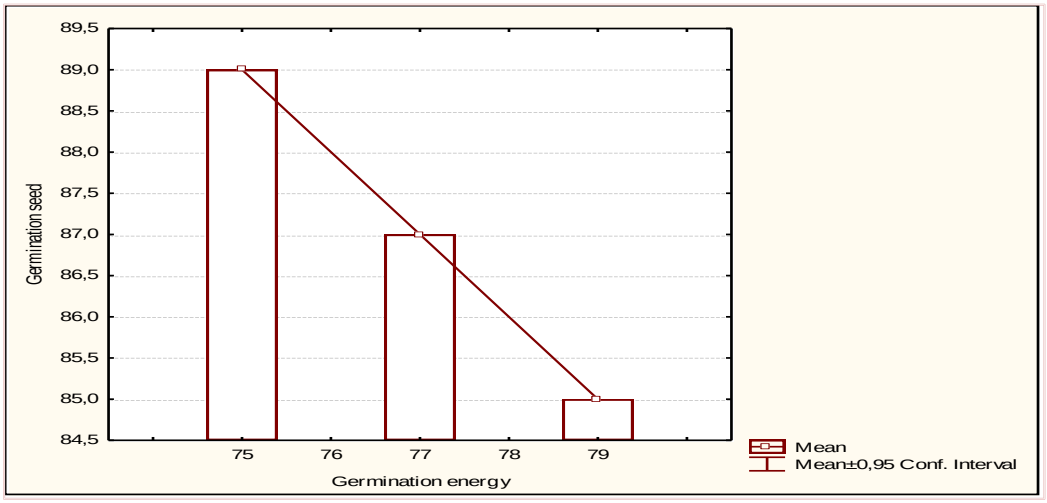
Phacelia is used in our country as a post-crop and honey plant. Genetic potential seed yields of variety NS Priora is 1000 - 1500 kg ha^{-1}, which would possibly be attainable if which would possibly be attainable if all seed could be harvested and losses through uneven maturity and/or shattering would be minimised. Grain yields of phacelia is 600-900 kg ha^{-1}. Phacelia flowering plant continues over 8 weeks (50-65 days) period (Popović et al, 2016a, 2017a, 2017b). Phacelia seed traits depend on many factors: genotype, the moisture content in physiologically mature seeds at harvest time, the technological maturation of seed, seed infection pathogens, the presence of pests and others. Seed characteristics are changed and due to different agro-ecological conditions.

NS Priora had high grain yield good quality. Flowering plant continues over 60 days. Grain yields of NS Priora in 2016 was 902 kg ha^{-1} (Popović et al, 2016, 2017a, 2017b). Average germination of seed, of NS Priora seeds harvested in 2016, was 87% and average germination energy was 77%, Table 1, Graph. 2.

The average thousand seeds weight was 1.42 g. The average cleanliness of seed, 98.28%, table 1. The standard error for thousand seeds mass was 0.02, Table 1, Graph. 3.

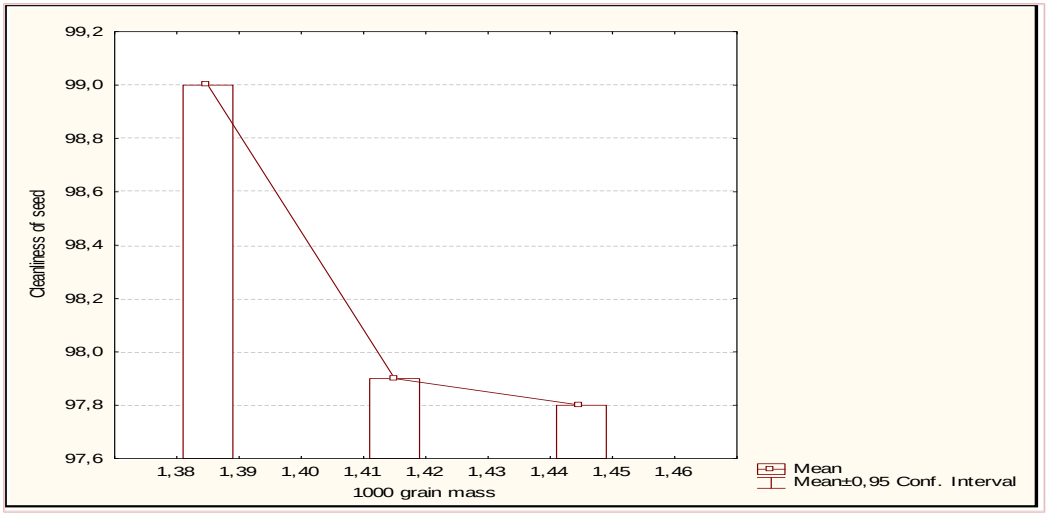
Table 1. The tested parameters of seed quality of variety NS Priora

Parameter	***Average***	***Minimum***	***Maximum***	***St. Dev.***	***St. Error***	***Variance***
Germination seed, *%*	87.01	86.00	88.02	2.00	1.15	4.00
Germination energy, *%*	77.01	75.05	79.00	2.01	1.16	4.00
Cleanliness of seed, %	98.23	97.8	99.00	0.66	0.38	0.44
Mass of 1000 seed,g	1.42	1.39	1.45	0.03	0.02	0.001
Nitrogen content, %	3.21	3.18	3.23	0.026	0.015	0.001
Protein content, %	20.06	19.85	20.19	0.18	0.11	0.04



Graph. 2. Germination seed and germination energy for seed NS Priora

Testing the quality of seeds shall be determined purity, germination, moisture, health, germination energy, 1000 seed weight and other properties. Determination of seed germination (viability of seed) presented the determination of maximum potential of germinated seeds of a single party. Filter paper can be used as a medium for testing the viability of seed. Inoculation is done is germination trays at a temperature of 20-30 ºC, or at a constant temperature of 25 ºC. After five days, reading is done of germination energy, and after 14 days viability is estimated, i.e., assessment of seedlings is performed. Germination energy represents the number of normal seedlings compared to the number of seed placed on germination determined after a expiry of time for the first assessment, i.e. the determining of germination energy. Germination energy and viability is expressed as a percentage of normal seedling, according to their number. Examination of the mass of 1000 of seed is carried out by taking a 1,000 seed from fractions "of pure seed" and their measurement determines 1000-seed weight average, expressed in grams. Length germination test was determined for each plant species. For phacelia smallest seed purity can be 94%, it can have up to 2% of other types, the lowest seed germination of 65,the maximum moisture content of 13% (Official Gazette of FRY 58/2002 - Rules on the quality of seed of agricultural plants).

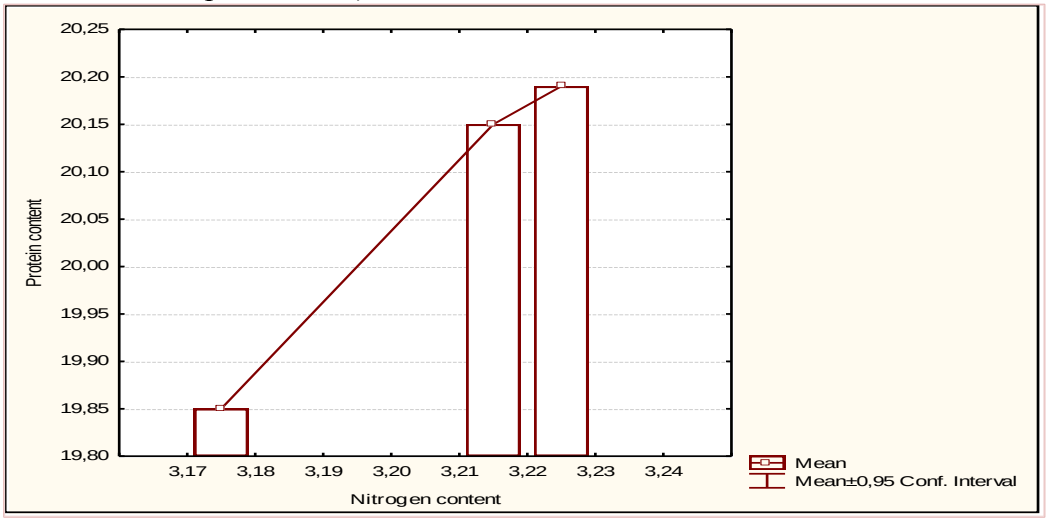


Graph. 3. Mass of thousand seeds and for cleanliness of seedv. NS Priora

NS Priora variety had average nitrogen content is 3.21% and protein content was 20.06%. The standard error for nitrogen content was 0.015, Table 1, Graph. 4.

One of the most important factors determining productivity is the photosynthesis process by which green plants accumulate organic matter and energy (Vasileva and Ilieva, 2017).

Agro ecological conditions depend on how many of the meteorological - edaphic conditions in an region of the same from the application agro-technical practices in the production of seed crops (Stevanovic et al., 2016). From above, it follows that properties of produced seed depend of procedures, totally controlled by human, from ecological conditions on which man can affects to some degree, on the genotype and on the interaction between all the above mentioned factors. By processing, seed materials eliminates the excess moisture and unwanted impurities and performes equalization of seed quality at condition suitable for sowing. During the processing procedures, properties of seed, in the natural seed material, are very important. Processing aim is to equalize usage characteristics of seed up to required agro-technology levels, regardless of production location and genotype (Popović, 2010; 2015; Glamočlija et al, 2015; Đekić et al., 2017; Terzić et al, 2016; Kresović et al, 2016; Živanović & Popović, 2016).



Graph. 4. Protein content and nitrogen content of seed for v. NS Priora

Phacelia is a hardy plant forage. It is grown for seed production, for obtaining green forage, silage, hay, as well as crop protection, crop of green fertilizers and as bee pasture (Popović et

al., 2017a). In Europe, it is grown in many countries as a forage and ornamental plant. Phacelia is exploited in the green state or as silage and it is used for green manure and as pasture for bees.It is grown for reduction of nitrate in the soil and the recycling of the nitrogen (Hulin, 1993). Phacelia can be used as green manure. Most of the plants for green manure areplowed after flowering by fragmentation of overground mass and entering into the soil two or three days before sowing the main crop. Siderats enriches the soil in organic matter, improves the biological activity of the soil, increases the capacity of soil for water, affects the soil-hygiene and biological drainage, improves use of the hard available nutrients, lessens leaching of nutrients and the nitrate and reduces the evaporation of the water from the soil (cover crops) thatrepresents negative impact of drought. For the reason of better environmental adaptation and larger overhead and underground mass with more biologically-linking nitrogen may be combined in a mixture of legume and non-legume siderat. In the spring of a mixture of heartburn, phacelia and spring beans or in the autumn, vetch and peas in a mixture with oats or rye). Phacelia is useful for soil because with its good developed root system and a number of leaves that covers the soil and protect it from erosion. Spring sowing phacelia it is possible to suppress the competitive weeds such as ambrosia, sorrel etc. (Bogović, 2013, Popović, 2017b). The thick root of phacelia, who often penetrates soil to a depth of 70 cm improves soil structure (Čolaković, 2006). Phacelia population decreases cyst nematodes (Globodera) in soil (Šubic, 2016).

Beekeepers growing variety phacelia NS Priora will have a safe pasture and high quality honey yields, to over 1 t ha^{-1}. Honey of phacelia has healing properties: has antibacterial, antifungal and anti-inflammatory, for inflammation of the mouth and throat. It is good for intestinal diseases, jaundice, as a diuretic, helps convalescent after surgery and diseases, slows aging and extends the life (Yashmak, 1980). Puškadija et al. (2004) says that the phacelia seeds used in pharmaceutical in making of drugs.

Conclusion

Variety phacelia NS Priora, in 2016, achieved a high seed yield and excellent seed quality. The average protein content amounted of 20.06% while the nitrogen content of the grains was 3.21%.

Phacelia in Serbia it is grown as a forage and ornamental plant, are exploited in the green state or as silage. It is used for green manure, as cover crops and as bee pasture.

By growing of variety phacelia NS Priora, beeceepers will have a safe pasture and high yield of quality honey, of over 1 t.

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References

Anonymous A. (1989): German information leaflet on Phacelia.

Bogović M. (2013): Green manure or sideration. http://www.agroklub.com/ratarstvo/zelena-gnojidba-ili-sideracija/9305/

Booker Seeds (1990): Information sheet on Phacelia.

Brzezowska, J., Dreszczyk E. (2009): Ocena przydatności roślin do uprawy alternatywnej z wykorzystaniem typowych systemów technicznych. Agricultural Engineering, 1(110), 45-52.

Cazzola, V. (1987): A discussion paper to the EEC on the inclusion of Phacelia tanacetifolia in the list of compulsory certifiable species. (Italian). Senenti Elette 33(6) : 7-10.

Daniel, P., Zobelt, V. (1986): Investigations about feed intake of fodder rape and phacelia. Inst. Pflanzenbau pflanzensuechtung 11, Justus Liebig Univeristy, Giesen Wirtschaftseigene Futter 32 (2): 175-182.

Čolaković E. (2006): California bluebell – the requested honey plant. Green Garden 43: 26

Glamočlija Đ., Janković S., Popović V., Filipović V., Kuzevski J., Ugrenović V. (2015): Alternatively crop plants in conventional and organic growing systems. Monograph. Belgrade, 1-355;

Đekić V., Popović V., Branković S., Terzić D., Đurić N. (2017): Grain yield and yield components of winter barley, 63 (1): 179-185. DOI: 10.17707/AgricultForest.63.1.21

Hulina N. (1993). Facelia - Phacelia tanacetifolia Benth. Attracts the attention of scientists and farmers / Facelija – Phacelia tanacetifolia Benth. privlači pažnju znanstvenika i poljoprivrednika. Agronomski glasnik 1-2: 125-129.

Jašmak K. (1980): Honey herbs. Nolit, Belgrade. / Medonosno bilje. Nolit, Beograd. In Serbian.

Kresović B., Ikanović J., Rajić Z., Tapanarova A., Dražić G., Popović V. (2016): Canary Grass as a viable energy source and its future. Energetika. 141-146.

Krober, H., Beckmann, E. (1975): Fungal damage on Phacelia tanacetifolia. Rachrichtenblatt des Deutsi: hen Pflanzenschutz dienstes 27 (12): 177-180.

Official Gazette of FRY 58/2002 - Rules on the quality of seed of agricultural plants

Orsi, S., Bionoi, A. (1987): Phacelia tanacetifolia: its honey potential. ltalia lnformatore Agrario 43(47): 53-51.

Popović M. Vera (2010): Influence of agro-technical and agro-ecological practices on seed production of wheat, maize and soybean. Doctoral thesis, University of Belgrade, Faculty of Agriculture, 1-145. 22-40.

Popović M. Vera (2015): The concept, classification and importance of biological resources in agriculture. Editor. Milovanovic J., Đorđević S.: Conservation and enhancement of biological resources in the service of ecoremediation. Monograph. Belgrade. ISBN 978-86-86859-41-9; 1-407. 29-51.

Popović V., Sikora V., Vučković S., Mihailović V., Filipović V., Živanović Lj., Ikanović J., (2016a): NS Priora–high nectar variety of phacelia [Phacelia tanacetifolia Benth]. Tehnološke inovacije–Generator privrednog razvoja. Banja Luka, BiH.

Popović V., Vidić M., Ikanović J., Đekić, V., Filipović V., Tabaković M., Veselić J. (2016b): Soybean oil yield as affected by the growing locality in agro-climatic divergent years."Agriculture and Forestry". Podgorica, Vol. 62, 1, 217-225.

Popović V., Marjanović-Jeromela A., Sikora V., Vučković S., Mihailović V., Živanović Lj., Ikanović J., Merkulov Popadić L. (2017a): Phacelia tanacetifolia Benth - Honey plant. Zbornik naučnih radova Instituta PKB Agroekonomik. Beograd.

Popović V., Sikora V., Živanović Lj., Čurović M., Terzić D., Kolarić Lj., Rajičić V., Ikanović J. (2017b): California bluebell. NS Priora for biomass production for obtaining the roughage. /Sorta facelije NS Priora za proizvodnju biomase u cilju dobijanja voluminozne stočne hrane. XXII Simposium on biotechnology. Book 1. 10.-11.3.2017. Čačak, 213-221.

Petkov, V. (1966): Study on some legume-phacelia mixtures as forage plants and honey plants. (Bulgarian). Rasterivudri Nauki 3(8): 127-133.

Ponichtera P. (2016): The sowing value of tansy phacelia (Phacelia tanacetifolia Benth.) seeds in the long-term storage. Agricultural Engineering No. 3 , pp. 153 -1 59 www.wir.ptir.orgm ISNN 2083 -1587; e -ISNN 2449 -5999 2016,Vol. 20, 3, 153-159.

Ramenda, S. (2003): Facelia błękitna. Agrochemia, 6, 25-28. Resolution of the Minister of Agriculture and Rural development as of 14th September 2010. (JoL No 183 Item 1230).

Senegonca, C., Frings, B. 1988. The influence of Phacelia tanacetifolia to pests and beneficial insects in sugar beet plots. Pedobiologia'32 (5-6): 311-316.

Stevanović P., Vučković S., Popović V., Ikanović J., Živanović Lj., Simić A., Rajičić V., Krsmanović, P. (2016): Influence of vegetation space, seeding rate and fertilization on the number of flowers and seed yield trefoil / Uticaj vegetacionog prostora, setvene norme i prihrane na broj cvetova i prinos semena žutog zvezdana (Lotus corniculatus L.). XXX Simposium of Institute of PKB Agro-econimic. Belgrade. Vol. 22. 1-2, 1-10.

Tabaković M., Jovanović S., Popović V., Ranković D., Stanisavljević R., Štrbanović R. (2016): Variability of hybrid maize seed traits of different locations. Jornal of Institite of PKB Agroeconomic. Pad. Skela. Belgrade.Vol. 22,1-2, 135-172.

Terzić D., Radović J., Marković J., Popović V., Milenković J., Vasić T., Filipović V. (2016): New technical-technological process of roughage production by combining an corn and soybean in double cropping. The technical solution. Belgrade. In Serbian.

Teittinen, P. (1980): Observations of the food plants of the honeybee. Annales Agriculturae Ferriae 19 (2): 156- 163.

Šubić M. (2016): Health safety potato tubers before planting. Gospodarski list br. 4: 60.

Živanović Lj. & Popović V. (2016): Production of soybean (Glycine max) in the world and in Serbia. Proizvodnja soje (Glycine max) u svetu i kod nas. XXI Simposium on biotechnology, 11-12.03.2016., Čačak, vol. 21 (23), 129-135.

Vasileva V. and Ilieva A. (2017): Some physiological parameters in mixtures of cocksfoot and tall fescue with subterranean clover. Bulg. J. Agric. Sci., 23 (1): 71–75.