

Summaries of the scientific publications of Chief Assistant Emil Stoychev Vasilev, PhD from the Maize Research Institute – Knezha, Bulgaria, regarding the competition for occupation of the academic position “Associate Professor” in the professional field 6.1. Crop Production, scientific specialty “Breeding and seed production of cultivated plants”, announced in the State Gazette No. 41 of May 21, 2019

4. Scientific publications submitted in referenced and indexed issues in the world-famous scientific information databases
4.1. Chakarov R., Vasilev E. 1995. Effect of the inter-mowing period on the productivity of some perennial grass stands. Plant Science, Sofia, vol. XXXII, № 6, 149-151. Web of Science (1985 до 2004) The field experiments are carried out in 1989-1992 on leached chernozem poorly supplied with nitrogen and phosphorus and well with potassium, pH 7.1. The experiments are conducted under non irrigation and under irrigation in order to investigate the effect of diverse inter-moving periods on the productivity of pure and mixed stands of newly created species of perennial grasses. It is established that 45 days is the most suitable inter-mowing period for the alfalfa variety Pleven 6 as well as for its mixture with the cocksfoot variety Dabrava under non irrigation the dry matter yield reaches 8491 and 10735 kg/ha, respectively. The increasing of inter-mowing period from 20 days to 30 days and 40 days under irrigation increases the dry matter yield of all the examined grass stands. The crude protein yield under irrigation and under non-irrigation follows the tendency of the dry matter amount of the respective regimes of utilization. The mixed grass stands are more productive than the pure ones under all the examined regimes of utilization. The increase reaches 26.4% under non-irrigation and 34.7% under irrigation.
4.2. Vasilev E., Chakarov R. 1998. Productivity of lucerne under different methods of growing and use. Plant Science, Sofia, vol. XXXV, № 9, 749-754. Web of Science (1985 до 2004) During the period of 1994-1997 a field trial was carried out without irrigation on typical chernozem supplied poorly with nitrogen, relatively well with phosphorus and well with potassium. The field trial was conducted by the block method with four replications on dense pure and mixed stand of lucerne with cocksfoot with 50:50 of the sowing rate of the pure stand. The study included different combination of the established technologies for forage and seed production by years. The yields of the dry mass and the seed production were considered. The method of lucerne growing has a substation influence on the productivity. The dense stands of lucerne variety Obnova 10 was grown with cocksfoot variety Dabrava are more high-yielding as compared to the wide-row ones – the increasing is 16% to 19%. The pure wide-row lucerne stands produces 3.5 more seed as compared to the dense one whereas in the mixture is opposite. In mixed growing of lucerne with cocksfoot more forage per unit area up to 19.9% is produces for the dense stands and up to 29.7% for the wide-row ones and the seed quantity is 7.7% to 22.2% less as compared to the pure lucerne stands.
4.3. Vasilev E. 2004. Sees productivity of lucerne (<i>Medicago sativa</i> L.) depending on stand type. Plant Science, Sofia, vol. 41, № 5, 474-478. Web of Science (1985 до 2004) A field trial was carried out during the period 1994-1997 at the Institute of Forage Crops – Pleven to determine seed productivity of lucerne depending on stand type. Two types of lucerne stands (pure and mixture of lucerne and cocksfoot at two inter-row spaces - 20 and 50 cm) were tested. Sowing rate of lucerne in the pure stands was 25 kg/ha for the stand with inter-row space

of 20 cm, 8.50 kg/ha for that with 50 cm and 13 and 4.50 kg/ha for these of mixture. It was found that the inter-row space influenced significantly structural characteristics of seed yield of lucerne, which was most pronounced during the first year when the yield from the stands with inter-row space of 50 cm was twice as high as compared to the yield from those with 20 cm. The sowing rate influenced seed productivity components (seed yield characteristics) only in the stand with inter-row space of 20 cm. The seed productivity of lucerne with sowing rate of 13 kg/ha exceeded three times that obtained with sowing rate of 25 kg/ha. During the two first years seed productivity of the mixed stands was almost equal to the pure ones, but during the next years it significantly decreased.

4.4. **Vasilev E.** 2004. Crude protein productivity of lucerne (*Medicago sativa* L.) varieties in mixtures with perennial grasses Plant Science, Sofia, vol. 41, № 5, 449-452.
Web of Science (1985 до 2004)

A field trial was carried out during 1994 – 1997 at the Institute of Forage Crops - Pleven to determine the crude protein productivity of lucerne in mixtures with perennial grasses. The varieties Obnova 10, Pleven 1 and Victoria in pure stands and in mixtures with cocksfoot Dabrava cv. and tall fescue Albena cv. were compared. The seed rate of lucerne and tall fescue was 25 kg/ha and that of cocksfoot 30 kg/ha. Simple two component mixtures (lucerne + cocksfoot and lucerne + tall fescue) at 1:1 ratio were tested. It was found that that the dry matter yield from mixtures lucerne + cocksfoot exceeded by 8%. There were no significant differences in crude protein content among the tested lucerne varieties. The crude protein content on average for the pure lucerne swards was higher than that of the mixture with cocksfoot and tall fescue by 8.5 and 4%, respectively. The crude protein productivity in the pure stands was practically equal to that from the mixtures with cocksfoot as a result of 8% higher dry matter yield, irrespective of the low crude protein content. The Victoria cv. was the most suitable lucerne variety for the conditions of Central North Bulgaria for pure and mixed swards with cocksfoot and tall fescue.

4.5. Vasileva V., Kostov O., **Vasilev E.**, Athar M. 2011. Effect of mineral nitrogen fertilization on growth characteristics of lucerne under induced water deficiency stress. Pakistan Journal of Botany, 43(6): 2925-2928.
Scopus (1996-)

Utility of lucerne crop fertilization with nitrogen fertilizer has been discussed in literature with controversy. In this study experiment was conducted to determine the effect of mineral nitrogen at the doses of 40, 80, 120 and 160 mg N/kg on some characteristics of lucerne under induced water deficiency stress at the stage of budding in a pot trial. It was found that mineral nitrogen at the doses of 120 and 160 mg N/kg soil increased the productivity of dry top mass by 17 and 23% in conditions of optimum moisture and by 9% in conditions of water deficiency stress at the dose of 80 mg N/kg soil. Application of mineral nitrogen at the dose of 120 and 160 mg N/kg soil increased the quantity of dry root mass by 43 and 38% for the conditions of optimum moisture, and by 54-56% for conditions of water deficiency stress. Mineral nitrogen fertilizing at the dose of 40 mg N/kg soil had the lowest suppressive effect on the nodulation (11%). The dose of 160 mg N/kg soil was found to be toxic to nodulation. The dose of 80 mg N/kg soil, at which the crop had the lowest sensitivity to water deficiency stress, was optimal for lucerne development.

4.6. Vasileva V., **Vasilev E.** 2012. Study on Productivity of some Legume Crops in Pure Cultivation and Mixtures. Agriculturae Conspectus Scientificus, ISSN: 1331-7768, vol. 77, No. 2, 91-94.
Scopus (2005-)

In the conditions of pot trial the productivity of birdsfoot trefoil (*Lotus corniculatus* L.) cv. Targovishte 1, sainfoin (*Onobrychis Adans.*) breeding №26, white clover (*Trifolium repens* L.) cv. Milka, and subclover (*Trifolium subterraneum ssp.brachycalycinum*) cv. Clear, in pure cultivation and in mixtures was studied. The treatments were as follows: 1. Birdsfoot trefoil

100%; 2. Sainfoin 100%; 3. White clover 100%; 4. Subclover 100%; 5. Cocksfoot 100%; 6. Birdsfoot trefoil + cocksfoot; 7. Sainfoin + cocksfoot 8. White clover + cocksfoot; 9. Subclover + cocksfoot; 10. Birdsfoot trefoil + subclover; 11. Sainfoin + subclover; 12. White clover + subclover. The ratio between components in the mixtures was 50:50. Cocksfoot (*Dactylis glomerata* L.) cv. Dabrava as a grass component was used. It was found, that aboveground dry matter yield of white clover, birdsfoot trefoil, sainfoin and subclover in mixture with cocksfoot was higher as compared to these in pure cultivation. Subclover in mixture with birdsfoot trefoil increased aboveground dry matter yield, but in mixture with sainfoin and white clover did not contribute to increase of their productivity.

4.7. Vasileva V., **Vasilev E.**, Tzonev R. 2016. Subterranean clover (*Trifolium subterraneum* L.) as a promising forage species in Bulgaria. Bulgarian Journal of Agricultural Science, 22 (No 2), 222-227.

Scopus (2008-)

The paper presents an overview of the possibility to use the subterranean clover (*Trifolium subterraneum* L.) (an annual leguminous self-seeding species, widespread component in the pastures of the temperate areas of Central and Northern Europe and America) for the forage production in Bulgaria. The biological and ecological characteristics of the species are given. On the basis of researches (pot and field trials), mainly performed in the Institute of Forage Crops - Pleven, Bulgaria and their results, the conclusions are drawn as for the using of subterranean clover as a forage resource under the climatic conditions of the country. When sown at an appropriate time in the autumn, it establishes a uniform stand before the beginning of the permanent cold spell and grows up early in the spring and forms a dense sward. The subterranean clover may be included in mixtures with the following components: legumes - birdsfoot trefoil and sainfoin, and grasses - cocksfoot, tall fescue, perennial ryegrass and crested wheatgrass. It decreases weed infestation, increases productivity and persistence of the pasture systems. Composition of the natural communities, in which it participates, shows that it is resistant to overgrazing, nitrification and ruderalization by domestic animals. Due to its self-seeding capacity, it may be used for under-sowing of degraded seed production stands. On the basis of its occurrence in different parts of the country and in the natural vegetation, the species is promising for establishment of forage crops. The participation of the subterranean clover in the perennial swards is also a tool to increase the biodiversity in the agrophytocoenosis. Subterranean clover as a component of sown pasture swards has practical applicability under the climatic conditions of Bulgaria.

4.8. Vasileva V., Ilieva A., **Vasilev E.** 2019. Content of cyanogenic glycosides in forage biomass of birdsfoot trefoil grown alone and in mixtures. Indian Journal of Agricultural Sciences, in press Web of Science, Scopus (1993-)

The content of cyanogenic glycosides in forage biomass of birdsfoot trefoil grown alone and in mixtures with subclover, cocksfoot and tall fescue was determined. Birdsfoot trefoil (*Lotus corniculatus* L.) (cv. Targovishte 1), three subclover subspecies, i.e. *Trifolium subterraneum* ssp. *brachycalycinum* (cv. Antas), *Trifolium subterraneum* ssp. *yaninicum* (cv. Trikkala) and *Trifolium subterraneum* ssp. *subterraneum* (cv. Denmark), cocksfoot (*Dactylis glomerata* L.) (cv. Dabrava) and tall fescue (*Festuca arundinacea* Schreb.) (cv. Albena) were used. The ratio of components in all mixtures was 50:50%. The content of cyanogenic glycosides was determined in leaves, stems and flowers in fresh plant samples from the plants grown alone, from the total sample of mixtures and from each component of the mixtures. Cyanogenic glycosides content in stems of birdsfoot trefoil was found 38.40 mg HCN/100 g DM, in leaves 90.39 mg HCN/100 g DM and in flowers 173.60 mg HCN/100 g DM, respectively. The content of cyanogenic glycosides in plants of three subclover subspecies was found very low, i.e. *Trifolium subterraneum* ssp. *subterraneum* (2.84 mg HCN/100 g DM), *Trifolium subterraneum* ssp.

brachycalycinum (3.18 mg HCN/100 g DM), *Trifolium subterraneum* ssp. *yaninicum* (7.87 mg HCN/100 g DM). Cocksfoot and tall fescue do not contain cyanogenic glycosides. In the mixtures of birdsfoot trefoil with subclover the content of cyanogenic glycosides increased in both components compared to their pure grown – in birdsfoot trefoil from 8.8% to 19.9%, and in subclover from 10.7 to 54.4%. The content of cyanogenic glycosides in birdsfoot trefoil increased by 6.0% in mixtures with tall fescue and with 17.9% in mixtures with cocksfoot. Cyanogenic glycosides content in the total sample of mixtures varies depending on the percent contribution of the components in the mixtures. The higher proportion of subclover in the mixtures with birds'-foot trefoil decreased the cyanogenic glycosides content.

4.9. Vasileva V., **Vasilev E.** 2019. Agronomic characterization and the possibility for potential use of subterranean clover in the forage production in Bulgaria. Pakistan Journal of Botany, print: ISSN 0556-3321, online: ISSN 2070-3368, in press
Scopus (1996-)

The permanent climate changes having occurred in the last decade present a serious risk to the agricultural crops. This requires to study new herbaceous forage species having pronounced resistance to unfavorable abiotic factors and good adaptive capacity towards the new conditions. Legumes species that can provide self-sowing and persist continuously in the sward become of practical importance. Subterranean clover (*Trifolium subterraneum* L.) is an annual drought resistant legume with winter-spring type of development and ability for self-sowing. The studies with subterranean clover during the last years showed that it has practical applicability under the climatic conditions of Bulgaria. When sown at an appropriate time in the autumn, it establishes a uniform stand before the beginning of the permanent cold spell and grows up early in the spring and forms a dense sward. Subterranean clover was found as a suitable component for mixtures with widely used perennial grass and legume forage crops and contributed to weed infestation decreasing, higher productivity and persistence of the pasture systems. In addition, due to the prostrate habit it is strongly tolerant to grazing. The subterranean clover is adaptable to the changing climatic conditions and its use as a natural bio-recourse in the pastures could be a contribution to finding a solution in the field of forage production to mitigate the adverse effects of climatic change.

4.10. Kosev V., Vasileva V., **Vasilev E.** 2019. Comparative biological characteristic of pea (*Pisum sativum* L.) varieties. Indian Journal of Agricultural Sciences, in press
Web of Science, Scopus (1993-)

Some basic quantitative signs and phenological indicators were analyzed for samples of seven forage peas of different origins. Plant material from aboveground and root biomass was analyzed for the next characteristics in two stages: i) in the beginning of flowering stage: plant height (cm), fresh stem weight (g), dry stem weight (g), root length (cm), fresh root mass weight (g), dry root mass weight (g), nodule number per plant and nodule weight per plant (g); in the technological maturity of seeds stage: number of pods per plant, number of seeds per plant, seed weight per plant (g), number of seeds in pod and seed weight in pod (g). The degree of earliness of specimens was determined. For all traits studied a broad sense heritability (H_b) was calculated. Hierarchical cluster analysis was applied for the grouping of genotypes by similarity and correlation analysis for the finding the relationships between the signs and their variability. Specimens which meet the highest plant length requirements, green mass yield root length, number and weight of nodules were shown. They are considered as suitable for inclusion as parent components in future breeding programs. Some correlations were found, i.e. between the fresh stem weight and the nodule number ($r = +0.951$), between the nodule number and the root length ($r = +0.949$) and between the weight and the number of seeds ($r = +0.950$).

8. Scientific publications and reports submitted in non-refereed peer-reviewed journals or in edited collective volumes

8.1. Dochkova B., **Vasilev E.** 2000. Effect of spring forage pea as cover of orchardgrass for seed on the number of some pests. Journal of Mountain Agriculture on the Balkans, vol. 3, № 5, 627-634.

The studies were conducted in 1999-2000. In the experimental field of the Forage Research Institute – Pleven a trial was carried out using spring forage peas (*Pisum arvense* L.), Pleven 4 variety as cover of cocksfoot (*Dactylis glomerata* L.) for seed. The total population density of pests from pea's emergence till harvesting was found to be lower in the stands with a cover crop. The decrease of the pests' number was 8.8 to 39.7% depending on pea's percentage in the sward as a cover crop. There was a positive correlation ($r=0.94$) between the sowing rate of the cover crop and the number of the pests. It was proved that in the stands with cocksfoot the numbers of the species of *Sitona* genus decreased 16.3% to 86.4%; 4.0 до 46.9% of the species of *Homoptera* order (aphids and cicadas); 8.8 to 43.3% of the species of *Thysanoptera* order (thrips). The growing of cocksfoot for seed with spring forage peas as cover crop can be used as a method and element of an integrated system for pest's control.

8.2. Kertikov T., **Vasilev E.** 2001. Forage productivity of spring pea grown as a cover of orchardgrass for seed production. Journal of Mountain Agriculture on the Balkans, vol. 4, № 2-3, 122-130.

Between 1998-2000 a field trial was carried out at the second experimental field of the Pleven Forage Research Institute in order to study the forage productivity of spring pea grown as a cover crop of orchardgrass for seed production. The Pleven 4 variety of spring forage pea with a sowing rate of 110 viable seeds/m² and the Dabrava variety of orchardgrass were used. Fertilizer application was performed according to estimated soil nutrition supply. Treatments tested using pea in the following percentages from its normal sowing rate: 1 Spring pea 100% (full sowing rate) – control; 2. Orchardgrass + spring pea 25%; 3. Orchardgrass + spring pea 50%; 4. Orchardgrass + spring pea 75%; 5. Orchardgrass + spring pea 100%. Orchardgrass participated with its full sowing rate in all the combinations. It was found that the main crop of orchardgrass grown for seed production in the year of stand establishment had no negative effect on the dry matter yield of spring pea harvested as a cover at the budding and flowering stages. At the flowering stage the yield of the cover crop depending on its participation percentages from the optimum sowing rate was higher than the harvested at the budding stage by 41.4% to 72.5%.

8.3. Kertikov T., **Vasilev E.** 2001. Study on the possibility to use spring forage pea for grain production as a cover for orchardgrass for seed production. Agricultural University - Plovdiv, Scientific Works, Научни трудове, vol. XLVI, book 2, Jubilee Scientific Session “80th Anniversary of the Higher Agricultural Education in Bulgaria”, 223-227.

During the 1998-2000 period at the Institute of Forage Crops - Pleven a trial was carried out with the objective to study the possibility to use spring forage pea for grain production as a cover for cocksfoot for seed production. It was found that the production that was formed from pea used as a cover was within the range of 83.1 to 165.0 kg/da grain and that of crude protein from 22.3 to 45.2 kg/da. The yield of spring pea was not influenced by the main crop of cocksfoot in the year of stand establishment.

8.4. Stoykova M., **Vasilev E.** 2003. Comparative economic effect of lucerne growing in pure stands and in mixtures with perennial grasses. Scientific conference with international participation “Stara Zagora 2003”, June, 5-6, 2003, Agrarian Sciences, vol. I, part. 2 Tremmatology, Stara Zagora Union of Scientists, 162-165.

On the bass of the study carried out in the experimental field of the Forage Crops Institute in Pleven in the 1994-1997 period economic effect of lucerne growing in pure stands and in mixtures with some perennial grasses was determined. It was found that the most effective way

of growing of lucerne is the mixture with cocksfoot: the net income is 69.45 lv/da, rate of profitability is 77.9% and the prime cost of hay is 0.04 lv/kg. In mixtures with tall fescue and in the pure stands, the economic effect of lucerne growing was lower.

8.5. **Vasilev E.**, Kertikov T. 2003. Influence of the cover crop of forage pea on seed productivity of cocksfoot. In: Optimal Forage Systems for Animal Production and the Environment. Kirilov A., Todorov N., Katerov I. (Eds.). Proceedings of the 12th Symposium of the European Grassland Federation, Pleven, Bulgaria, 26-28 May 2003. Grassland Science in Europe, vol. 8, 419-422.

In the spring of each year from 1998-2000 perennial seed production stands of cocksfoot (*Dactylis glomerata* L.) with a cover crop of forage pea (*Pisum sativum* L.) were established. The influence of sowing rate of the cover crop (50, 75 and 100% of the control) and harvest time (at the budding, flowering and full maturity of seeds) on seed production of cocksfoot during the next year was studied. Average seed yield of cocksfoot for the period was positively influenced in the stand with 75 and 100% of the sowing rate of the cover crop when it was harvested at earlier stages – budding and flowering.

8.6. Dochkova B., **Vasilev E.** 2003. Influence of the mixed growing of spring forage pea as a cover to perennial ryegrass for seed on injurious insect numbers. In: Optimal Forage Systems for Animal Production and the Environment. Kirilov A., Todorov N., Katerov I. (Eds.). Proceedings of the 12th Symposium of the European Grassland Federation, Pleven, Bulgaria, 26-28 May, 2003. Grassland Science in Europe, vol. 8, 408-410.

In 2001-2002 a field trial was conducted on spring forage pea (*Pisum sativum* L.), Pleven 4 variety as a cover to perennial ryegrass (*Lolium perenne* L.) for seed. It was found that the population densities of a number of injurious insect species from emergence to harvesting of pea was lower in the stands with a cover, the harmful insect decrease was 36.4 to 47.0% depending on pea percentage within the mixture. There was a positively correlation ($r=0.68$) between the pea sowing rate and the injurious insect numbers. In the stands with a cover the number of the species of order *Coleoptera* decreased 11.1 to 33.3%, the species of order *Homoptera* (aphids and cicadas) 27.9 to 7.7%, the species of order *Thysanoptera* (thrips) 45.6 to 62.0%. The mixed growing of perennial grasses with annual leguminous forage plants can be applied as a method of integrated system of injurious insect control.

8.7. **Vassilev E.** 2003/2004. Comparative testing of Bulgarian alfalfa varieties in mixtures with grasses. Pastagens e Forragens, vol. 24/25, 2003/2004, p. 35-43.

A field trial was carried out in the North Central of Bulgaria to establish the highest forage productive of some Bulgarian alfalfa (*Medicago sativa* L.) varieties in pure stand and double component mixtures with grasses – cocksfoot (*Dactylis glomerata* L.) and tall fescue (*Festuca arundinacea* Schreb.) in proportion 1:1. Obnova 10, Pleven 1 and Victoria of lucerne varieties were used. It was found that the weight participation of alfalfa variety Victoria was higher than these of the other two varieties in all stands. It was valid especially for the second and third cut. Grass weight participation was significant in the first cut when the plants formed reproductive stems and lower in the following. Victoria was the most productive alfalfa variety in all tested stands. The average annual dry mass yield in the pure stand was 15.673 kg/ha and in the mixture with cocksfoot 16.809 kg/ha, respectively. There were not significant differences between the yields of the varieties in the mixture with tall fescue.

8.8. **Vasilev E.** 2004. Possibilities for using spring pea as a cover to seed production stands of perennial ryegrass. I. Forage productivity of spring pea grown as a cover to perennial ryegrass for seed production. Journal of Mountain Agriculture on the Balkans, vol. 7, № 5, 536-545.

From 2001 to 2003 a field trial was carried out in the second experimental field of the Forage Crops Research Institute in Pleven with the purpose of the studying the forage productivity of spring pea grown as a cover to perennial ryegrass for seed production. The suitability of spring

forage pea as a cover to perennial ryegrass for seed production was studied with regard to the percentage participation of pea in its sowing rate in a pure stand (100%, 75% and 50%), as well as the stage of the cover crop at harvest – for green mass at the budding and flowering stages. The highest yields of dry mass were obtained at the cover sowing rate of 100% harvested at the pea budding stage and at the sowing rate of 75 and 100% at the flowering stage. The main crop didn't influence considerably the formation of dry matter. The yield from the cover crop harvested at the flowering stage was higher by 50 to 61% depending on its percentage participation in the optimum sowing rate as compared with the crop harvested at the budding stage.

8.9. **Vassilev E.** 2004. Forage productivity of some Bulgarian lucerne cultivars in mixtures with grasses. In: Land Use Systems in Grassland Dominated Regions. Luscher A., Jeangros B., Kessler W., Huguenin O., Lobsiger M., Millar N. and Suter D. (Eds.). Proceedings of the 20th General Meeting of the European Grassland Federation, Luzern, Switzerland, 21-24 June, 2004. Grassland Science in Europe, vol. 9, 401-403.

During the period 1994-1997 a field trial was carried out in the North Central region of Bulgaria. The objective of the study was to establish the forage productivity of some Bulgarian lucerne (*Medicago sativa* L.) cultivars in pure stand and in double component mixtures with the grasses cocksfoot and tall fescue, each in proportion 1:1. The lucerne cultivars Obnova 10, Pleven 1 and Victoria were used. It was found that Victoria was the most productive in all tested stands. The average annual dry matter yield in pure stand was 15.673 kg/ha and in the mixture with cocksfoot 16.809 kg/ha. There were no significant differences between the yields of the cultivars in the mixtures with tall fescue. The dry matter yield was higher in the mixed stands by 8.8%.

8.10. **Vasilev E.** 2004. Possibilities for using spring pea as a cover to seed production stands of perennial ryegrass. II. Seed productivity of spring pea grown as a cover to perennial ryegrass for seed production. Journal of Mountain Agriculture on the Balkans, vol. 7, № 6, 711-719.

From 2001 to 2003 a field trial was carried out in the second experimental field of the Forage Crops Research Institute - Pleven with the purpose of studying the seed productivity of spring pea grown as a cover to perennial ryegrass for seed production. The seed productivity of spring pea as a cover was studied with regard to the proportion of pea in its sowing rate in a pure stand (100%, 75% and 50%). Pea cv. Pleven 4 with a sowing rate of 110 germinated seeds/m², and ryegrass cv. Meretti with a sowing rate of 830 germinated seeds/m² were used. It was found that normal seed yield from spring pea as a cover to perennial ryegrass for seed production was obtained only when using 100% of its sowing rate. Perennial ryegrass did not affect considerably the seed yield formed by the cover with sowing rate of 100%.

8.11. **Vasilev E., Kertikov T.** 2005. Influence of spring pea as a cover on the seed productivity stands of cocksfoot. Plant Science, Sofia, 42, 5, 402-406.

During the period 1998-2000 each spring one field trial was conducted with the purpose of determining the influence of spring pea as a cover to seed production stands of cocksfoot on the seed productivity of perennial grass crop during the next year. The percentage participation of pea on its sowing rate in pure stand (50, 75 and 100%), as well as the stage of cover harvesting for both fresh mass at budding and flowering stages and grain at the stage of physiological ripeness of seed were studied. It was found that in years of favorable meteorological condition spring pea used as a cover to seed production stands of cocksfoot led to an increase of reproductive stem number and seed weight per area unit. On the average for the period of study spring pea used at sowing rate of 75 and 100% harvested at budding and flowering stages increased seed productivity of cocksfoot 22 to 28%.

8.12. **Vasilev E.** 2005. Economic estimation of seed production stands of perennial ryegrass established under cover of spring forage pea. Journal of Mountain Agriculture on the Balkans, vol. 8, № 5, 650-663.

During the period 2001-2004 each spring a field trial was established with the purpose of estimating the economic expedience of establishment of seed production stands of perennial ryegrass under cover of spring forage pea for the period of stand establishment and the first harvest year. Forage pea was sown at 50, 75 and 100% participation of its sowing rate and harvested for green mass at the phenological stages of budding and flowering and for grain at technical ripeness. The economic analysis showed that the use of spring forage pea as a cover for seed production stands of perennial ryegrass at 75% and 100% of its sowing rate harvested for green mass, on average for the first two years resulted in an increase of total output by 72% to 87%, as well as in an increase of profitability over two times as compared to the seed production stands without cover.

8.13. **Vasilev E.** 2005. Intertolerance and productivity of crested wheatgrass (*Agropyron cristatum* L.) in pasture mixtures with white clover. In: Integrating Efficient Grassland Farming and Biodiversity. Lillak R., Viiralt R., Linke A., Geherman V. (Eds.). Proceedings of the 13th International Occasional Symposium of the European Grassland Federation Tartu, Estonia, 29-31 August 2005, Grassland Science in Europe, vol.10., 348-351.

Finding more suitable and productive grass component for white clover (*Trifolium repens* L.) pasture mixtures is a significant problem for Bulgarian pasture management. Taking into account the permanent climate change, the introduction of new or not very popular species is an approach to find more sustainable productive pasture swards. Crested wheatgrass (*Agropyron cristatum* L.) is a perennial drought resistant mesophyte grass that has higher forage production during the hot and dry vegetation period. It was tested as a component in binary mixtures with white clover to determine its suitability and productivity compared to perennial ryegrass (*Lolium perenne* L.). Results of the trial conducted during 2001-2004 showed that the contribution of white clover in mixture with wheatgrass was two times higher than that with perennial ryegrass.

8.14. **Vasilev E.** 2006. Crude protein productivity from forage pea grown as a cover for seed production stands of perennial ryegrass. Plant Science, Sofia, vol. 43, № 2, 145-148.

During the 2001-2003 period a field trial was carried out at the Institute of Forage Crops – Pleven with the purpose of studying the forage productivity of spring forage pea grown as a cover crop for seed production stands of perennial ryegrass. The suitability of spring forage pea as a cover for seed production stands of perennial ryegrass was tested regarding the percent participation of pea from its sowing rate in a pure stand (100%, 75% and 50%), as well as the stage of harvesting of the cover crop – budding or flowering. The highest crude protein yield was obtained from the stands with 100% sowing rate of the cover crop and exceeded the crude protein yield from the stands with 75% sowing rate by 16% and 11%, respectively for the harvesting at the budding and flowering stages of pea. The average crude protein yield for the stands harvested at the flowering of the cover crop was by 39% higher as compared with the crude protein yield for the stands harvested at the budding stage.

8.15. **Vasilev E.** 2006. Possibilities for use of spring forage pea as a cover for seed production stands of perennial ryegrass and its effect on seed yield. Field Crops Studies, Dobroudja Agricultural Institute, vol. III, № 3, 441-446.

To determine the possibility of spring forage pea to be used as a cover for perennial ryegrass seed production stands and its effect on the seed yield in the next year, a field trial was carried out at the Institute of Forage Crops, Pleven during the period 2001-2003. The pea percentage of its sowing rate in a pure stand, namely 50, 75 and 100% were tested, as well as the stage of harvesting of the cover: for green mass at budding and flowering stages, and for grain - at stage of physiological ripeness of seeds. It was found that averaged for the period the use of spring

forage pea as a cover for seed production stands of perennial ryegrass harvested for green mass at budding and flowering stages did not decrease seed yield from ryegrass in the first harvest year. Under favourable meteorological conditions the seed yields in the next year from the ryegrass stands under cover at 100 and 75% sowing rate harvested at budding and flowering stages exceeded that of pure ryegrass by 11 to 16%, respectively. The use of spring forage pea as a cover for seed production stands of perennial ryegrass in years with favourable meteorological conditions did not decrease the seed yield from ryegrass in the first harvest year.

8.16. Vasileva V., Kostov O., **Vasilev E.** 2006. Development of lucerne (*Medicago sativa* L.) treated with mineral fertilizer and manure at optimal and water deficit conditions. Communications in agricultural and applied biological sciences, Ghent University, ISSN 13791176, 71, 4, 5-17.

A study on the effect of different rates of mineral fertilizer and manure on yield parameters of lucerne under optimal and water deficit conditions was carried out. Leached chernozem soil and lucerne cultivar Victoria were used. The soil was treated with ammonium nitrate and fully matured cattle manure. The plants were grown under optimum moisture content of 80% and 40% of field capacity. The water deficit stress decreased top and root biomass by 11-75% and 3-29% at mineral and organic fertilization, respectively. The applied mineral and organic N strongly depressed nodules development. Both mineral fertilizer and organic manure at dose of 210 mg N/kg soil completely inhibited the appearance of nodules. Next to nitrogen, water deficit stress further inhibited the development of nodules. Nitrogen fertilization increased seed productivity in the two experimental moisture conditions. The water deficit stress decreased seed productivity by 18 to 33% as compared to optimum conditions. The plant treatments with manure were much more resistant to water deficit and recovering ability of plants was faster as compared to treatments with mineral fertilizer. The application of manure stimulates development of drought-stress tolerance in lucerne. However, the results obtained can be considered for the soil type and experimental conditions used.

8.17. **Vasilev E.**, Kertikov T. 2006. Economic evaluation of cocksfoot seed producing planting created under the cover of spring forage pea. Agricultural economics and management, vol. LI, № 3, 48-51.

During the spring sowing, being a many year grass plant the cocksfoot is characterized by a slow growth rate and weak competitiveness due to which the plantings are strongly weeded and the cocksfoot's forage productivity is low. In this regards, the aim of the authors of this paper is to perform an economic estimation concerning the efficiency while creating cocksfoot's seed producing plantings under the cover of spring forage peas for the period of planting creation and the first crop gathering year. The Pleven 4 variety of forage peas was used as a cover with participation of 50%, 75% and 100% of the established sowing rate. The cover was used for producing green mass gathered in the phenophases of budding and flowering as well as for grain in technical ripeness. From the performed analysis of the economic results it was found that the use of the spring forage pea as a covering plant while creating seed producing cocksfoot plantings brings about an increase of the gross output of 59 to 75% for the first two years on the average and the asset return ability as compared to other seed producing plantings without cover increases approximately threefold. Seed production of spring forage pea used as a cover of seed producing plantings of cocksfoot is economically justified. Under spring planting with a 100% participation of the cover rate, for the first two years there is accounted a 37% increase of the gross output.

8.18. Vasilev E. , Vasileva V. 2006. Economic evaluation of lucerne stands for forage fertilized with mineral fertilizer and manure. Journal of Mountain Agriculture on the Balkans, IUSA, Troyan, Agricultural Academy, vol. 9, № 7, 1203-1213.
An economic evaluation of lucerne stands for forage was made in a field trial carried out during the period 2000 - 2003 in the experimental field of the Institute of Forage Crops - Pleven. Three levels of application of mineral fertilizer (ammonium nitrate) and well-rotted cattle manure on a phosphorus and potassium background were studied. The economic evaluation was performed on the basis of technological charts and a system of natural and value characteristics. It was found that the lucerne fertilizing with mineral fertilizer at the doses of 7 and 14 kg N/da increased the total output by 4 and 6% and the manure application at the doses of 7, 14 and 21 kg N/da by 10, 14 and 16%, respectively. The economic evaluation of the lucerne stands for forage fertilized with mineral fertilizer and manure showed the advantages of manure use as compared to mineral fertilizer. The manure application at the dose of 14 kg N/da on a phosphorus and potassium background proved to be economically the most profitable for forage production.
8.19. Vasilev E. 2006. Dry matter yield from sainfoin in binary mixtures with perennial ryegrass and cocksfoot. Field Crops Studies, Dobroudja Agricultural Institute, vol. III, № 4, 571-575.
A field trial was carried out at the Institute of Forage Crops - Pleven during the period of 2003-2005. The trial was laid out under non-irrigated conditions on low leached chernozem soil. Sainfoin cultivar Jubilejna in pure stand and binary mixture with perennial ryegrass (cv. Meretti) and with cocksfoot (cv. Dabrava) were tested. The legume:grass ratio was 1:1. There were no differences in weed infestation and dry matter yield between sainfoin pure stand and binary mixtures with ryegrass and cocksfoot in the year of establishment. Averaged for the second and third year, sainfoin dominated in the swards of the tested stands, except for fourth cut for the mixtures. Weed infestation in sainfoin pure stand was heavier as compared to the mixtures and varied from 6.3% to 23.5% in first and second cut, respectively. The weed portion in mixtures was minimal in first cut, and in the next cuts it was 3-4 times less as compared to pure sward. Dry matter yield from sainfoin mixture with cocksfoot averaged for the second and third year, exceeded dry matter yield from pure stand by 20%. There were no differences in dry matter yield between sainfoin pure stand and mixture with perennial ryegrass.
8.20. Vasilev E. 2006. Productivity of subclover (<i>Tr. subterraneum</i> L.) in pasture mixtures with grasses under conditions of Central North Bulgaria. Plant Science, Sofia, vol. 43, № 2, 149-152.
During the period 2001-2005 a field trial was carried out at the Institute of Forage Crops – Pleven to determine the productivity of subclover in mixtures with grasses under the conditions of Central North Bulgaria. Pure sward of subclover (<i>Trifolium subterraneum</i> L., cv. Clear), white clover (<i>Trifolium repens</i> L., cv. Debjut), crested wheatgrass (<i>Agropyron cristatum</i> L., local population), and perennial ryegrass (<i>Lolium perenne</i> L., cv. Meretti), as well as binary mixtures between them were tested. Legume:grass ratio was 1:1. The data of botanical composition showed that subclover predominated in the swards of first, fourth and fifth cut, and the subclover participation was significantly higher as compared with white clover. It was found that the clover participation was higher in mixtures with crested wheatgrass, and significantly lower in mixtures with perennial ryegrass. There were no significant differences in dry matter yield obtained from subclover and white clover pure swards, as well as from the mixtures with grasses.
8.21. Vasileva V., Vasilev E. 2006. Dry matter yield of sainfoin swards under a frequent cutting regime. Quality Legume-Based Forage Systems for Contrasting Environments. Helgadottir A. and Potsch E. M. (Eds.). Proceedings of the Final Meeting 30 th August- 3 rd September 2006, Gumpenstein, Austria, 231-234.
A field trial was carried out at the Institute of Forage Crops - Pleven, Bulgaria during the period 2003-2005. The trial was laid out under non-irrigated conditions on slightly leached chernozem soil. Sainfoin cv. Jubilejna in pure stand and in binary mixtures with perennial ryegrass (cv.

Meretti) and cocksfoot (cv. Dabrava) were tested under a frequent cutting regime. The legume:grass ratio was 1:1 in the mixed stands on the basis of sowing rate. Two, five and six cuts were obtained in 2003, 2004 and 2005, respectively. It was found that the highest dry matter yield was obtained from the mixture of sainfoin and ryegrass in the second year, and from the pure sainfoin stand in the third year (on average for second and third year) had a higher dry matter yield in the first cut and a lower yield in the third and fifth cut, as compared to the pure sainfoin stand. The mixture of sainfoin and cocksfoot had a significantly higher yield in the fourth cut.

8.22. **Vasilev E.**, Vasileva V. 2006. Botanical composition and crude protein content of sainfoin swards under a frequent cutting regime. Quality Legume-Based Forage Systems for Contrasting Environments. Helgadottir A. and Potsch E. M. (Eds.). Proceedings of the Final Meeting 30th August- 3rd September 2006, Gumpenstein, Austria, 235-238.

A field trial under non-irrigated conditions on slightly leached chernozem soil was carried out at the Institute of Forage Crops - Pleven. Sainfoin cultivar Jubilejna in pure stand and in binary mixtures with perennial ryegrass and cocksfoot were tested under a frequent cutting regime. It was found that sainfoin predominated in the swards, except for third and fifth cut, on average for the second and third year. Its proportion was greater in the mixture with ryegrass than with cocksfoot. Weed infestation in the pure sainfoin stand was heavier than that in the mixtures. Crude protein content in the mixture of sainfoin with ryegrass was higher than that in mixture with cocksfoot, due to its greater portion in the sward. There were no differences in crude protein yields between the pure sainfoin stand and mixtures with grasses.

8.23. **Vasilev E.**, Vasileva V., Mihovsky Tz., Goranova G. 2006. Assessment of legume based mixture swards constrained by the environmental conditions in Central North Bulgaria - COST Action 852. Sward dynamics, N-flows and Forage Utilisation in Legume-Based Systems. Wachendorf M., Helgadottir A., Parente G. (Eds.). Proceedings of the 2nd COST 852 workshop held in Grado, Italy 10-12 November 2005, ISBN: 88-89402-05-9, 177-180.

A part of common experiment was established at Institute of Forage Crops - Pleven, Bulgaria within Working Group 2 of COST Action 852. The aim of study was to assess legume based mixture swards constrained by the environmental conditions in Central North Bulgaria. Pure and mixed swards of *Lolium perenne* L., *Dactylis glomerata* L., *Trifolium pratense* L. and *Trifolium repens* L. were tested under high and low densities. The results obtained suggest the including of red clover as a component of grass/legume mixture with higher portion resulting in an increase in dry matter yield. White clover contributes more to the sward dry matter yield when the sowing rate and competition between species are low.

8.24. **Vasilev E.**, Vasileva V., Mihovsky C., Goranova G., Ilieva A. 2006. COST 852- Results of Common experiment under contrasting conditions in Bulgaria. Quality Legume-Based Forage Systems for Contrasting Environments. Helgadottir A. and Potsch E. M. (Eds.). Proceedings of the Final Meeting 30th August- 3rd September 2006, Gumpenstein, Austria, 97-99.

A field trial was carried out according to the common methods of COST 852 (www.cost852.com) to determine the advantages of grass-legume mixtures in two different regions of Bulgaria. There was no significant mixture advantage at either site. In Pleven red clover was the most productive species but this was not observed in Troyan. Mixtures had lower infestation of unsown species at both sites but the levels of infestation were much higher in Troyan.

8.25. Kirilov A., **Vasilev E.**, Dimitrova A. 2006. Assessment of palatability of different grass and legume species, and of their combinations. In: Sustainable Grassland Productivity. Lloveras J., Gonzales-Rodríguez A., Vazquez-Yañez O., Piñeiro J., Santamaría O., Olea L. and Poblaciones M. J. (Eds.). Proceedings of the 21st General Meeting of the European Grassland Federation,

Badajoz, 3-6 April, 2006. Grassland Science in Europe, vol. 11, 363-365.
Forage palatability is a relative characteristic accumulating all forage attributes related to intake and digestibility. In this context, the palatability of cocksfoot (<i>Dactylis glomerata</i> L.), crested wheatgrass (<i>Agropyron critatum</i> L.), sainfoin (<i>Onobrychis viciifolia</i> Scop.), white clover (<i>Trifolium repens</i> L.) and birdsfoot trefoil (<i>Lotus corniculatus</i> L.) was compared through the preference of cows for them during grazing. The above mentioned grass and legume species were grown alone and in all 10 possible two-component mixtures between them each of plots of 12 m ² in four replications. The preferences of twelve cows for the different swards were assessed by visual observation, every 5 min. of each animal during the first hour after the animals were taken to the grazing paddock along four consecutive days, six hours per day. During the observed period the cows spent 48.7% of the time grazing legumes grown alone and their mixtures, 10.7% of the time grazing pure and mixtures grasses, and 40.6% of the time grazing grass:legume combinations. The ratio between time spent for grazing legumes, grass:legume mixtures and grasses was 5:4:1 which is similar to the grazed forage quantity of the respective legumes, grass:legume mixtures and grasses.
8.26. Vasileva V., Vasilev E. 2006. Effect of presowing treatment of seeds with insecticides on productivity of alfalfa. In: Sustainable Grassland Productivity. Lloveras J., Gonzales-Rodríguez A., Vazquez-Yañez O., Piñeiro J., Santamaría O., Olea L. and Poblaciones M. J. (Eds.). Proceedings of the 21 st General Meeting of the European Grassland Federation, Badajoz, 3-6 April, 2006. Grassland Science in Europe, vol. 11, 324-326.
A pot experiment to determine the effect of presowing treatment of seeds with insecticides on the productivity of alfalfa (<i>Medicago sativa</i> L.) grown for forage was carried out at the Institute of Forage Crops - Pleven, Bulgaria. Alfalfa cultivar Obnova 10 was used. Insecticides Promet 400 SK (furathiocarb) at a rate of 3 L/100 kg seed and Carbodan 35 ST (benzofuran) at a rate of 1, 2 and 3 L were used. It was found that the presowing treatment resulted in an increase in the productivity of dry top mass from 9 to 14% as compared to the untreated control. This measure exerted a positive effect as well as on the quantity of dry root mass, with an increase from 12% to 23%. Carbodan 35 ST applied for presowing treatment at a rate of 3 L/100 kg seed showed the greatest effect in terms of the productivity of alfalfa grown for forage.
8.27. Vasileva V., Vasilev E. , Kostov O. 2006. Effect of water deficiency stress on nitrogen yield of lucerne under mineral and organic fertilisation. Sward dynamics, N-flows and Forage Utilisation in Legume-Based Systems. Wachendorf M., Helgadottir A., Parente G. (Eds.). Proceedings of the 2 nd COST 852 workshop held in Grado, Italy 10-12 November 2005, ISBN: 88-89402-05-9, 173-175.
A study on the effect of water deficiency stress on nitrogen yield of lucerne under mineral and organic fertilization was carried out. Ammonium nitrate and matured cattle manure as a source of mineral and organic nitrogen were used. The plants were grown under optimum moisture content of 80% and 40% of field capacity. It was found that water deficiency stress decreased nitrogen yield most when 210 mg mineral N/kg soil were used (42%). At 70 and 210 mg organic N/kg soil nitrogen yield decreased with 26%. The dose of 210 mg organic N kg/soil resulted in the highest accumulation of nitrogen yield under water deficiency stress.
8.28. Kirilov A., Vasilev E. 2007. Palatability of grasses and legumes. Journal of Mountain Agriculture on the Balkans. 14 th meeting of the FAO-CIHEAM Mountain Pasture Network, 30 May to 1 June 2007, Troyan, Bulgaria. Adapting management to the new challenges of European Mountain Grasslands, 101-103.
The palatability of some grasses: cocksfoot (<i>Dactylis glomerata</i> L.) and wheatgrass (<i>Agropyron critatum</i> L.), and legumes: sainfoin (<i>Onobrychis viciifolia</i> Scop.), white clover (<i>Trifolium repens</i> L.) and birdsfoot trefoil (<i>Lotus corniculatus</i> L.), grown alone or in mixtures between them was compared with the palatability of natural swards through the preference of sheep for them

measured by the time of grazing during the first hour. It was found that the palatability of legumes was over two times higher than that of grasses. Participation of legume component in mixtures with grasses increased more than two times the palatability of mixtures as compared to the palatability of grasses pure grown or mixtures, containing grasses only. The palatability of natural swards was higher than that of grasses in pure or mixed stands, but was lower than the palatability of legumes and mixture of legumes and grasses.
8.29. Vasilev E. , Vasileva V., Mihovsky C., Goranova G., Ilieva A. 2007. Chemical composition of legume/grass swards of the COST 852 Experiment in Bulgaria. In: Journal of Mountain Agriculture on the Balkans. National Centre For Agricultural Sciences. Research Institute of Mountain Stockbreeding and Agriculture. 14 th meeting of the FAO-CIHEAM Mountain Pasture Network, 30 May to 1 June 2007, Troyan, Bulgaria. Adapting management to the new challenges of European Mountain Grasslands. ISSN 1311-0489, 28-35.
A field trial was carried out according to the common methods of COST 852 (www.cost852.com) to determine the advantages of the mixtures on the basis of perennial legume species in two different regions of Bulgaria. Crude protein content in dry matter was closely correlated with the sward botanical composition. For Pleven site, red clover was the highest dry matter productive species and this predestined crude protein content in pure and mixed stands for 100% sowing rate. The same tendency was found for the stands with 60% sowing rate, but white clover portion was a bit higher, and this reflected on crude protein content. For Troyan site, grasses predominated in the swards, weed infestation was higher than that in Pleven, and this predestined lower crude protein content.
8.30. Vasilev E. , Vasileva V. 2007. Botanical composition and dry matter yield of birdsfoot trefoil swards under simulated grazing. In: PERMANENT and TEMPORARY GRASSLAND. Plant, Environment and Economy. A. De Vlieghe and L. Carlier (Eds.), Proceedings of the 14 th Symposium of the European Grassland Federation, Ghent, Belgium, 3-5 September, 2007, Grassland Science in Europe, vol. 12, 106-109.
A field trial under non-irrigated conditions on low leached chernozem soil was carried out at the Institute of Forage Crops - Pleven during the period of 2004-2006. Birdsfoot trefoil (Targovishte 1 variety) was studied in a pure stand, as well as in binary mixtures with cocksfoot (Dabrava variety) and with wheatgrass (<i>Agropyron cristatum</i> L.). The sowing rate of the legume:grass mixtures was 1:1. The swards were cut at the height of 20-25 cm to imitate grazing regime of utilization. It was found that birdsfoot trefoil portion was greater in swards of the mixtures with wheatgrass as compared to the mixture with cocksfoot. The weed infestation in the mixture of birdsfoot trefoil with cocksfoot was considerably lower as compared to the pure birdsfoot trefoil. Dry matter yield obtained from the mixtures of birdsfoot trefoil with cocksfoot was higher than the yield obtained from the pure birdsfoot trefoil for the second year and similar for the third year.
8.31. Vasilev E. 2007. Biological control of weeds in artificial pasture swards with white clover. Plant Science, Sofia, 44, 173-175.
To study the possibility for biological control of weeds in artificial swards with white clover a field trial on leached chernozem was carried out at the Institute of Forage Crops – Pleven during the period of 2001-2005. Pure sward of white clover (<i>Trifolium repens</i> L., cv. Debut) and binary mixtures with crested wheatgrass (<i>Agropyron cristatum</i> L., local population), and perennial ryegrass (<i>Lolium perenne</i> L., cv. Meretti) were tested. The legume:grass ratio was 1:1. It was found that the plant community of white clover, and crested wheatgrass and perennial ryegrass under pasture schedule of use considerably opposed to the weeds. The weedness in the mixtures was approximately two times lower as compared to pure white clover. Average for the 4-year period dry matter yield from the mixture white clover + crested wheatgrass was higher by 12% as compared to dry matter yield, and by 5% as compared to dry matter yield of mixture white clover

+ perennial ryegrass.
8.32. Vasilev E. , Vasileva V., Kabamitova R. 2007. State of sainfoin stands and dry mass yield during the fourth year. Journal of Mountain Agriculture on the Balkans, IUSA, Troyan, Agricultural Academy, vol. 10, № 4, 669-678.
During the 2003- 2006 period at the Institute of Forage Crops in Pleven, a field trial was carried out with the purpose of determining the state of sainfoin stands and dry mass yield during the fourth year. Sainfoin variety Yubileyna and breeding №239 were studied in pure stands and in binary mixtures with perennial ryegrass and with cocksfoot under extensive and intensive regime of utilization. It was found that sainfoin participated with a greater portion in the sward of mixture with ryegrass under both regimes of utilization and weed infestation was heavier in pure stand and mixture with ryegrass. Under extensive regime of utilization, the dry mass yield from sainfoin breeding №239 was higher than that from variety Yubileyna by 27% in pure stand, and 29% in its mixture with ryegrass. Under extensive regime of utilization there were no differences in sainfoin density between pure stand and mixtures at the end of the fourth year. Under intensive regime of utilization, sainfoin had smaller density in mixtures, except for the mixture of breeding №239 with ryegrass. On average for the studied swards, the plant density of breeding №239 was greater than that of variety Yubileyna by 46 % under extensive, and by 33% under intensive regime of utilization.
8.33. Vasilev E. , Stoykova M. 2007. Economic efficiency of some alternative regimes of using lucerne stands. Agricultural economics and management, 52, 4, 53-57.
The economic efficiency of some alternative regimes of using lucerne stands, combining the technologies for both, forage and seed production was found. The mixed regimes of lucerne use for both forage and seed are a good alternative of production, particularly in years of unfavourable climatic conditions when the seed yield can fail, as well as in cases of need of cheap proteinaceous forage maintaining the level of lucrativity and profitability of economic activity. The regime of using lucerne in years first and third for forage and in years second and fourth for seed was found as economically the most efficient alternative to the growing of lucerne for forage only.
8.34. Vasilev E. 2008. Effect of regime of growing of birdsfoot trefoil on the botanical composition of the swards and dry matter yield. 80 years agrarian science in Rodopes. Proceedings from the Jubilee scientific conference with international participation Smolyan, September, 25-26, 2018, 166-169.
A field trial was carried out at the Institute of Forage Crops – Pleven during the period 2004-2007 to find the botanical composition and dry mass yield from the sown swards with birdsfoot trefoil in binary mixtures with cocksfoot and wheatgrass under pasture regime of use. It was found that birdsfoot trefoil predominated in the sward of binary mixtures with cocksfoot and wheatgrass in all the cuts, except for the fifth cut in the mixture with cocksfoot. The share of birdsfoot trefoil was higher in the mixture with wheatgrass as compared to mixture with cocksfoot. Weeding was strongest in pure grown birdsfoot trefoil in the fourth cut as well as in the pure grown wheatgrass in all cuts. The proportion of weeds was found smallest in mixtures, especially in the birdsfoot trefoil with cocksfoot mixture. Dry mass yield from birdsfoot trefoil, grown in binary mixtures with cocksfoot and wheatgrass on average for the period of study was by 14 and 10% higher than that of pure birdsfoot trefoil. The inclusion of wheatgrass into binary mixture with birdsfoot trefoil led to an increase the part of the birdsfoot trefoil and weeds in the sward as compared to mixture with cocksfoot.