REVIEW

АГРАРЕН УНИВЕРСИТЕТ BX. Nº HODGAENO Nº 18. Получено на ...

Prepared by Prof. Dr. Zarya Vasileva Rankova from the Fruit-Growing Institute, Plovdiv, a member of the Scientific Panel in accordance with Order No. RD-16-50 of 22 January 2021 of the Rector of the Agricultural University – Plovdiv, referring to the Competition for the academic position of an Associate Professor in the Area of Higher Education: 6. Agricultural Sciences and Veterinary Medicine; Professional Field: 6.2. Plant Protection, Scientific Major: Plant Protection (Weed Science), announced in SG No. 98 of 17.11.2020. Applicant: Chief Assist. Prof. Dr. Anyo Yordanov Mitkov from the Agricultural University – Plovdiv

Brief presentation of the applicant

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Chief Assist. Prof. Dr. Anyo Yordanov Mitkov was born in 1980. He graduated from the Agricultural University – Plovdiv in 2004, obtaining a Master's degree in the Master's program 'Agricultural Pharmacy'. In the period 2007-2010 he was an Assist. Prof. in the Department of General Farming and Weed Science at the Agricultural University – Plovdiv and in 2012 he acquired the Educational-and-Scientific degree 'Doctor' in the professional field 6.2. Plant protection (Weed Science). In 2011 he took the academic position of a Chief Assistant Professor.

1. General description of the scientific production

Chief Assist. Prof. Dr. Anyo Mitkov participates in the competition for the academic position of an Associate Professor with a total production of 33 scientific works, grouped as follows:

- Habilitation work – scientific publications (at least 10) in journals referenced and indexed in world-famous databases with scientific information (Web of Science, Scopus) – 10 publication;

- Published monograph on the basis of a defended Thesis for awarding the Educationaland-Scientific degree 'Doctor' or for awarding the scientific degree 'Doctor of Science' -1;

- Scientific publication in journals referenced and indexed in world-famous databases with scientific information -12;

- Scientific publications in unreferenced peer-reviewed journals or in edited collective volumes – 7;

- Published university textbook or textbook used in schools – 1;

- Published university manual or a manual used in schools -2.

The presented individual reference for compliance with the National Minimum Requirements shows that the Applicant covers, and according to some groups of indicators, even exceeds the minimum number of points required for the academic position of an Assoc. Professor under Art. 2b, para. 2, 3 and 5 of the Act on Development of the Academic Staff in the Republic of Bulgaria and Annex to Art. 1 of the Regulations for the Application of the Act. According to the presented scientific publications in the competition for the academic position of an Associate Professor, the applicant is the only author of 2 papers and 1 book, and the first author of 14 publications.

The research investigations of Chief Assist. Prof. Dr. Anyo Mitkov are in the field of integrated weed control systems for major field crops, focused on the following areas:

1. Weed control in wheat

- The efficiency and selectivity of the herbicides Secator OD and Biathlon 4D + adjuvant Dash, applied at officially registered and higher rates, were studied in a field trial with winter wheat of 'Enola' cultivar. The highest efficiency of the herbicides and the highest yield were obtained in the variant treated with Biathlon 4D + Dash applied at the rate of 0,14 kg/ha + 1,0 l/ha in the phenological stage of first – second stem node (BBCH 30-32).

- It was found that the herbicide Ergon WG applied at a rate of 7 g/da, successfully controlled most broadleaf weeds. The efficacy of Ergon WG against *Galium aparine* (L.) and *Cirsium arvense* (L.) was excellent when used at the higher rates of 8 and 9 g/da. The working mixtures of Ergon WG + Puma Super 7,5 EW; Ergon WG + Topic 080 EC and Ergon WG + Axial 050 EC showed excellent miscibility without any antagonism in terms of efficacy against both broadleaf and grassy weeds.

- The possibilities for herbicide control of self-seeded CLEARFIELD® rapeseed and coriander in winter wheat were studied. Treatment was performed with Derby Super WG- 2,5 g/da; Starane Gold – 150 ml/da; Biathlon 4D – 5 g/da; Mustang SC – 60 ml/da. The herbicides were applied at the end of tillering phenological stage. The results showed that the treatment with Mustang SC had the highest herbicidal efficiency against self-seeded CLEARFIELD rapeseed – 93% and coriander – 95%, and the highest yield was obtained in that variant.

- The possibilities of treatment with herbicides, applied separately or in a combination, in wheat of 'Enola' cv. were investigated. The results showed that after treatment with Derby Super WG, Secator OD, Maton 600 EC, Pallas 75 WG, Hussar Maxx OD and Puma Super 7,5 EW, the highest efficiency and the highest yield (5,78 t/ha) were reported in the variant with combined application of Pallas75 WG + Derby Super WG.

- The biological efficacy of some foliar-applied herbicides (Pallas 75 WG, Derby Super WG, Weedmaster 464 SL, Laren 60 WP and Hussar maxx WG) against economically important weeds was studied in a field trial with wheat.

- The herbicide efficacy of five foliar-applied systemic herbicides (Axial 050 EC, Topic 080 EC, Puma Super 100 EC, Pallas 75 WG and Hussar Maxx WG) against field brome (*Bromus arvensis* L.) was investigated in wheat fields. Some of those herbicides are active against grassy weeds and others have a mixed spectrum of action. The results of the study varied from complete lack of effectiveness of some of those products against field brome, through partial effect of others, to 100% control of the grassy weed species after treatment with Pallas 75 WG.

- The efficacy and selectivity of three herbicide products for registration in Bulgaria were studied: RXR 49 (metsulfuron-methyl + tribenuron-methyl + florasulam), SGE 27 (metsulfuron-methyl + tribenuron-methyl + fluroxypyr) and R7U12 (thifensulfuron-methyl + fluroxypyr). The herbicide treatment was carried out at the end of tillering – beginning of stem elongation stage (BBCH 29-31) in a trial with winter wheat of 'Enola' cv. The highest herbicide efficacy and the

highest yield (7,14 t.ha⁻¹) were obtained after treatment with SGE 27 applied at the rate of 750 ml/ha.

2. Weed control in maize

- The biological efficacy of some soil herbicides was studied (Merlin Duo, Adengo 465 SC and Lumax 538 SC) in maize hybrid P 1114. The herbicides were applied after sowing before crop emergence. The highest herbicide efficiency and highest yield (11,8 t/ha) were obtained after treatment with Merlin Duo at a rate of 2,0 l/ha. All the studied herbicides were selective to the grown maize hybrid.

- The effect of the herbicides Equip OD -2,5 l/ha, Elumis OD -2,0 l/ha, Arigo WG + Trend 90 -0,33 kg/ha +0.1%, Samson Extra 6 OD -0,75 l/ha, Samson 4 OD -1,25 l/ha, Principal Plus WG + Trend 90 -0,44 kg/ha +0.1%, Capreno SC + Mero -0,29 l/ha +2,0 l/ha was studied in the maize hybrid P 9241. The efficacy of the tested herbicide products against weeds was evaluated. The highest yield was obtained after the application of Principal Plus WG -1,53 t/da.

- The efficiency of three working mixtures of herbicides was studied, applied during the vegetation of both the crop and the weeds. In each of the herbicide combinations the herbicide *nicosulfuron* 40 g/l (Nishin 4 OD) was used at the rate of 130 ml/da. Treatments with *Fluroxypyr* 200 g/l (Flurostar 200 EC) – 70 ml/da, *florasulam* + 2,4 D (Mustang 306,25 SC) at a rate of 60 ml/da and *mesotrione* 480 g/l (Callisto 480 SC) – 20 ml/da were applied for control of broadleaf weeds. The best weed control and the highest yield was established after the combined use of Flurostar 200 EC and Nishin 4 OD.

- The efficiency and selectivity of Kabadex Extra, Starane Gold SE, Derby Super WG, Mustang 306,25 SC, Casper 55 WG and Arat WG were studied in the maize hybrid P 9537. The application of Kabadex Extra + Das Oil, Derby Super WG (at the rates of 0,033 kg/ha, 0,025 kg/ha and 0,033 kg/ha + Das Oil), as well as Starane Gold at a rate of 1,5 l/ha caused low phytotoxicity to the crop. The highest grain yield (984,19 kg/da), as well as the highest efficiency of the herbicides against *Chenopodium album* L., *Amaranthus blitoides* L., *Xantium strumarium* L., *Abutilon theophrasti* Medic., *Datura stramonium* L. and *Solanum nigrum* L. were obtained after the application of Kabadex Extra at a rate of 0,033 l/ha + Das Oil – 1,0 l/ha.

3. Weed control in rapeseed

- In a field trial with rapeseed (*Brassica napus* L.), hybrid PX 111 CL (Clearfield® hybrid), six herbicide products were studied: Salsa 75 WG, Galera Super, Modaon 4 F, Fusilade Forte 150 EC, Stratos Ultra and Cleranda. The highest efficiency of the herbicides against the available weeds, as well as the highest yield was reported in the variant with combined application of Galera Super + Fusilade Forte 150 EC.

- High selectivity of the herbicide combination Cleranda SC + Dash + Lontrel 72 SG in rapeseed was established.

- The herbicide efficacy of some folia applied herbicides (Butisan 400 SC, Butisan Max, Stratos Ultra, Agil, Fusilade Forte and Cleranda) on the control of fescue in rapeseed was studied. A very good result was established after treatment with Butisan 400 SC and Cleranda at the rate of 150-200 ml/da in Clearfield technology. The results showed that the treatment applied

in the phenological stage of fourth – sixth leaf had a better effect compared to the variants with earlier treatments (second – fourth leaf) and later (sixth – eighth leaf).

- It was confirmed that the herbicide Lontrel is highly effective but it showed a lower weed control of the species *Cirsium arvense* L., *Anthemis arvensis* L. and others. The herbicides Lontrel, Galera 334 SL and Galera Super did not control grassy weed species and when such weeds are available, it is necessary to use systemic or working mixtures with other herbicides, which are effective against grassy weeds. After treatment with the two studied herbicide combinations (Galera 334 SL + Stratus Ultra and Galera Super + Gallant Super), an excellent effect against grassy weeds was reported without establishing visual incompatibility or antagonism of their herbicide efficiency in rapeseed crops.

- The possibilities for control of branched broomrape (*Phelipanche ramosa* (L.) Pomel) in winter rapeseed with imazamox-containing herbicides was investigated. The highest herbicide efficiency against the root parasite was reported after treatment with Pulsar Plus – 2,00 l/ha (BBCH 51) – 92,9%, followed by Cleranda – 2,00 l/ha (BBCH 31-33) – 91,2%.

4. Weed control in sunflower

- The possibilities for weed control in sunflower fields using Clearfield technology were studied. The improved 'Clearfield Plus' technology was the object of study. The results of the experiments showed that the largest differences in the efficacy of Pulsar 40 were reported in the control of perennial weed species. When Pulsar 40 was applied alone without Dash, its efficacy against Johnson grass, corn thistle, field bindweed, hemp agrimony, common cocklebur, white goosefoot, purslane and branched broomrape was significantly reduced. Referring to its efficacy against annual broadleaf weeds such as redroot pigweed, charlock mustard, wild radish, cleavers, black nightshade, etc., it was 100%, with no differences between the applied rates of 80, 100 and 125 ml/da. The use of the herbicide alone at a rate of 125 ml/da showed the same efficacy against some weeds that are more difficult to control, as that of Pulsar applied at a rate of 80 ml/da plus 80 ml/da of Dash adjuvant.

- The efficacy of the herbicides Gardoprim Plus Gold 550 SC and Spectrum 720 EC used in low rates in sunflower fields was analysed. The use of working mixtures of the two studied herbicides increased the efficacy against some dicotyledonous weeds, for example *Solanum nigrun* L., *Abutilon theophrasti* L. and *Amaranthus retroflexus* L.

- The possibilities of SU technology for efficient weed control in sunflower were investigated. SU technology is associated with the use of a broad-spectrum broadleaf herbicide from the group of *sulfonylureas* – *tribenuron*. The aim was to optimize the results of the use of Express 50 SG (500 g/kg *tribenuron*) by applying it in different systems, terms and working mixtures with other products to achieve safe and efficient weed control. The results obtained showed the advantage of mixing Express 50 SG with Trend 0,1% adhesive (surfactant) only when not used in a combination with another foliar-applied herbicide in the working mixture.

- Trials were carried out to evaluate the efficacy of imazamox-containing herbicide products for control of sunflower broomrape (*Orobanche cumana* Wallr.). For achieving the aim set, Pulsar 40 and Pulsar Plus were applied in increasing rates. The results showed that the highest yield of sunflower grain was reported after treatment with Pulsar Plus at the rate of 2000 ml/ha applied in the phenological stage of the eighth – tenth true leaf.

- The possibilities for herbicide control of hemp (*Cannabis sativa* L.) in sunflower grown by the 'Express sun' technology were studied. The major herbicide in that technology is Express 50 SG, containing 500 g/kg tribenuron-methyl using Trend 90 adhesive and the herbicide Pledge 50 WP (active substance flumioxazine 500 g/kg) at a rate of 7 g/da.

5. Efficacy and selectivity of herbicides in other agricultural crops

- The efficacy of 7 herbicides in chickpea was studied: Spectrum (720 g/l dimethenamid-P), Stomp Aqua (455 g/l pendimethalin), Afalon 45 SC (450 g/l linuron), Pulsar 40 (40 g/l imazamox), Corum SL (224 g/l imazamox + 480 g/l bentazone), Bazagran 480 SL (480 g/l bentazone) and Stratos Ultra (100 g/l cycloxydim). The herbicides were applied in the spring after sowing before the emergence of the crop. The highest efficiency was reported in the variant treated with Corum SL + Dash, at the rate of 1,25 + 0,625 l/ha. The highest phytotoxicity was reported in the variant with Basagran 480 SL + Stratos Ultra applied at the rates of 2,0 + 2,0 l/ha.

- Under the conditions of a pot experiment, the efficiency and selectivity of some soil and foliar herbicides in pumpkins were investigated (Dual Gold (960 g/l s-metolachlor) – 1200 ml/ha; Dual Gold – 1500 ml/ha; Stomp New (330 g/l pendimethalin) - 4000 ml/ha; Stomp New – 5000 ml/ha; Spectrum (720 g / l dimethenamid-P) – 800 ml/ha and Spectrum - 1400 ml/ha). The effect of the herbicides applied at different rates on seed germination and the external symptoms of phytotoxicity were reported.

6. General studies related to the technology of growing field crops as a basis for further weed science research

- The effect of foliar fertilization with zinc in the form of suspended zinc hydroxynitrate on the yield and quality of maize grain, as well as on zinc distribution in the plant organs was studied. The synthesized zinc hydroxynitrate has the potential of a long-acting foliar fertilizer. Ensuring the optimal concentration of Zn at different terms during the vegetation season leads to a significant increase in yield along with improving the quality of maize grain.

- The effect of urea fertilization without incorporating the content of N, P, K and crude protein in the grain of barley was also studied. The highest nitrogen content was found in the variant with applying 25,0 kg/da. There was a tendency to an increase in the crude protein content in the barley grain with the increase in the fertilization rates of urea, the highest content being established in the variant with applying 25,0 kg/da.

As a result of the overall research activity of the applicant, **29 scientific and scientific**and-applied contributions are confirmed. The most significant of them are those of original character (*contributions No. 10 and 11 of the reference*), which provide information on the herbicidal efficacy of some active substances for control of weed species in Bulgaria.

I accept that the contributions are personal findings of the applicant and I should note that they bring new and important information in the development of existing scientific problems, i.e. efficient and environmentally friendly weed control in major field crops based on in-depth research.

Citations of the scientific publications

The scientific works of Chief Assist. Prof. Anyo Mitkov have been cited in six scientific publications:

- in Bulgarian scientific journals – 1;

- in Bulgarian and foreign scientific journals, with IF, indexed and referenced in various databases (Web of Science, Scopus) -5.

Participation in research projects and tasks

Chief Assist. Prof. Dr. Anyo Mitkov has participated in the implementation of four research projects and in one of them he was the coordinator – an implementation (consulting) project at the Research Centre of the Agricultural University – Plovdiv with Syngenta Bulgaria.

Participation in international and national scientific forums

Chief Assist. Prof. Dr. Anyo Mitkov has attended important scientific forums both in our country and abroad (Romania, Bosnia and Herzegovina, Turkey, Croatia).

Assessment of the teaching activity of the applicant

Chief Assist. Prof. Dr. Anyo Mitkov, along with his research work, has a significant experience in teaching. It is evident from the attached certificate from the Agricultural University – Plovdiv that the applicant taught 2271 academic hours to Bachelor and Master degree students for the period 2015-2020.

Personal impressions and recommendations

I do not find any significant gaps in the conducted research, which would have an eventual effect on the evaluation results and the conclusions made.

Conclusion

At the announced competition for the academic position of an Associate Professor in the Scientific Major 04.01.10 Weed Science, Professional Field 6.2 Plant Protection, the only applicant Chief Assist. Prof. Dr. Anyo Yordanov Mitkov presents scientific papers in sufficient quantity and quality. The scientific and scientific-and-applied contributions in them are a novelty for science and an enrichment of the existing knowledge.

The research publications presented by Chief Assist. Prof. Dr. Anyo Mitkov in the competition confirm that he is an established researcher in the field of weed science and modern integrated systems for weed control in major field crops. According to the criteria for the scientific and metric indicators, the applicant fully meets the requirements of the Act on Development of the Academic Staff in the Republic of Bulgaria and the Regulations of the Agricultural University – Plovdiv for taking the academic position of an Associate Professor.

Chief Assist. Prof. Dr. Anyo Yordanov Mitkov has in-depth knowledge in the field of modern methods for weed control, statistical methods, he uses freely and interprets correctly the scientific literature and the results obtained.

All that gives me the reason to evaluate POSITIVELY the applicant and to recommend to the honorable members of the Scientific Panel to vote POSITIVELY and Chief Assistant Professor Dr. Anyo Yordanov Mitkov to be elected as an ASSOCIATE PROFESSOR in Professional Field 6.2 Plant Protection, Scientific Major 04.01.10 Weed Science (Herbology).

Prof. Dr. Zarya Rankova

17.02.2021

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