

Aleksandar Mikić, the legume (re)searcher

1 | INTRODUCTION

Aleksandar Mikić was born in Pančevo, Serbia, on 9 January 1974, and died on 5 September 2021, Novi Sad, Serbia. He received BSc in 1998, MSc in 2008, and PhD in 2014 in Plant Genetics and Breeding at the University of Novi Sad, Faculty of Agriculture. He worked as Research Associate and annual legume breeder at the Institute of Field and Vegetable Crops in Novi Sad, Serbia, from 2000 to 2018. His fields of interest encompassed conventional and molecular genetics, genetic resources, breeding, agronomy, agroecology, and crop history of annual legumes. Dr. Mikić co-authored more than 350 journal papers, about 120 international conference papers, over 10 book chapters and one book. He has also authored more than 30 cultivars of annual legumes and various forage crops registered in Serbia and abroad. Aleksandar's scientific horizons were endless, including archaeobotany, linguistics, plant biology, breeding, and farmers communities.

2 | PASSION FOR LEGUMES—LEGUME SOCIETY

He was among the creators of the UN FAO 10-Year Research Strategy for Pulse Crops (2016) and a member of the Editorial Board of the journal *Genetic Resources and Crop Evolution* (since 2018). Since 2013, he has been an Assistant Editor of the international journal *Legume Perspectives*, as well as International Legume Society Executive Committee member and Secretary. He was a task leader in the FP7 project Legumes for the Agriculture of Tomorrow (LEGATO, 2014–2017) and one of the coordinators of the bilateral cooperation Serbia-Portugal project STRESSLESS (2015–2017). In the ECO-NET project (2008–2009) supported by French Ministry of Foreign and European Affairs, he was a strong contributor of a consortium between France, Bulgaria, Russia, Serbia, and Republic of Srpska (Bosnia and Herzegovina), searching for a new genetic variability in pea and faba bean to support the development of sustainable agriculture. As European Association for Grain Legume Research (AEP) representative, he strongly contributed at the program of the 7th European Conference on Grain Legumes and 5th International Food Legume Research Conference (AEP VII & IFLRC V) LEGUMES FOR GLOBAL HEALTH Antalya, Turkey, from 26 to 30 April 2010 (Figure 1). After the disclosure of European Association for Grain Legume Research, he very actively started lobbying for new

organization which would unify more broadly researchers working with legumes (Mikić, Rubiales, Smýkal, & Stoddard, 2011). In 2005–2006, Aleksandar took the opportunity of engaging with the EU community of legume scientists by promoting the engagement of NS SEME with the Technology Transfer Platform (TTP) of the FP6 Grain Legumes Integrated Project. He was an active participant of the TTP meeting in Montpellier in February of 2006. For some of us, this was our first engagement with his enthusiasm for the application of basic science to practical ends. It was a beginning of an intellectual engagement that was relatively poorly represented by joint publications, but initiated the series of scientific conferences which eventually resulted in the formation of the International Legume Society (ILS). He was one of the founding members of ILS, which he strongly supported in various ways during its development from the ashes of AEP—including the creation of the Society logo in his inimitable artistic style. He offered to host the first ILS conference in Novi Sad in 2013 and shaped nearly each aspect of it, from the conference name (2013: A Legume Odyssey) to the conference logo, bags, and badges. Most importantly, when ILS created its magazine, *Legume Perspectives*, Aleksandar voluntarily acted as the Technical Editor and formatted and edited himself all the pdf files and issues of the magazine for 5 years. Also, he created the first ILS website.

Many of us had the privilege to meet him and to receive from him high motivation charged with passion for legumes and plants in general. The legume community as we know it today is open, lively, creative and with a good sense of humor. Aleksandar contributed greatly to these features with his own exceptional example, insight, and human characteristics. He foresaw ILS as a key opportunity for legume research and transfer to industry, linking together the research on all legumes worldwide (grain, forage, pharmaceutical, or ornamental ones; from the Old World to the Americas).

His interdisciplinary approach to legumes resulted in incorporating anatomical research into his work and bringing botanists into the research team. This cooperation resulted in publication of several papers oriented towards the application of anatomical methods in evaluation and improvement of forage legumes. Aleksandar was delighted by discovering inner, hidden world of legume cells and tissues, which provoked his attitude to art. Anatomy found its way and application in research of intercropped legume species (Zorić et al., 2012, 2015), in estimation of forage digestibility and quality (Zorić, Luković, et al., 2014; Zorić, Mikić, et al., 2014; Zoric et al., 2011), but also in getting closer insight into beautiful Vavilovia (Zorić et al., 2010). Major keywords in his activity were as follows:



FIGURE 1 Aleksandar Mikić at AEP VII & IFLRC V conference held in Antalya, Turkey 2010

genetic resources, their knowledge and exploitation, to build new cropping systems and new cultivars. He evaluated a lot of genetic resources, with particular interest in farmer's populations, targeting legume benefits, exploring features able to alleviate negative impacts of agriculture on environment and to develop healthy foods (Mikić, Mihailović, Cupina, Dordević, et al., 2011; Vasić et al., 2009).

3 | BEAUTIFUL *Vavilovia*

Since the mid-2000s, and for more than 10 years, Dr. Mikić was intensively promoting studies of the monotypic legume genus *Vavilovia* (tribe Fabeae), found in the stony highlands of the Caucasus and Middle East. Due to its rarity and growing in remote localities, this endangered plant has been poorly studied. Most of studies of its biology and obscure taxonomic status were carried out by the Soviet botanists, primarily by researchers from the Vavilov Institute of Plant Industry (VIR, Russia), and these works were not familiar worldwide.

It was Aleksandar who decided to draw public attention to this species by organizing the publishing of an abstract and poster on the 6th European Conference on Grain Legumes in Lisbon (Vishnyakova et al., 2007) which initiated a sequence of later publications. This fact alone speaks of his erudition and, in this case, of his intuition. A little

later, a new surge of interest in this species arose: the organization of new searches, papers on its new findings, and different aspects of the species biology. Most of these activities were inspired by Aleksandar. He was passionately integrating an international team of plant scientists from Serbia, Russia, Czech Republic, Armenia, the United Kingdom, and other countries to get as much information on 'beautiful' *vavilovia*, *V. formosa*, as possible. Several expeditions to the regions of *Vavilovia*'s natural habitat were inspired. This plant, previously known mostly to focused specialists on taxonomy of the Fabeae, has become a subject of researches on its morphology (Atlagić et al., 2010; Zorić et al., 2010), ex situ conservation (Akopian et al., 2010), genome size and karyotype (Atlagić et al., 2010; Ochatt et al., 2016), and intraspecific diversity (Smykal et al., 2017), as well as on the possibility to cultivate *V. formosa* in a tissue culture (Ochatt et al., 2016). All known data on localities where this plant was ever recorded were reviewed (Vishnyakova et al., 2016). Aleksandar Mikić initiated the wave of enthusiasm for this species. He also contributed significantly to compile old works on *V. formosa* and make them accessible and familiar to all legume biologists. One of his last papers (Mikić, 2020) drew attention to a *Vavilovia*-related paper published in Russian in 1990. As in most other cases, Aleksandar's admiration for this unusual plant found its reflection not only in research papers but also in poetry and drawings, which was unusual—although not of surprise for all those who knew his style of work.

Lady of the heights
 Memories of aeons gone
 World saved by beauty
 (Mikić, 2019)

4 | *Pisum* AND *Lathyrus* RESEARCH STRIKES BACK!

Aleksandar's interests in pea were typically broad from the archeology of their early introduction to Europe (Ljuština & Mikić, 2010) and diversity of plant architecture (Mikić, Mihailović, Čupina, Kosev, et al., 2011) to the role of microRNAs in relation to environmental stress (Jovanović et al., 2014). In typical fashion, Aleksandar's activities involved broad international collaborations (Gali et al., 2019).

Aleksandar Mikić was also very enthusiastic about the genus *Lathyrus*. Many of its species are underused but have a high production potential as crops. Dr. Mikić actively contributed to technical dissemination, such as describing new intercropping schemes or production components, and their characterization and reintroduction into production especially on the Balkan region (Boža et al., 2003; Čupina et al., 2009; Hammer et al., 2019; Mihailović et al., 2013; Mikić, Mihailović, Čupina, Đurić, et al., 2011). Moreover, Dr. Mikić was inspirational for researchers working worldwide with underused crop species, and established collaborations with many of them, perseveringly seeking for international funds never easy to find in these kind of crops. One of his successes was the funding of the

bilateral cooperation Serbia-Portugal project STRESSLESS (Agronomic significance of abiotic stress response in Portuguese and Serbian local landraces of grass pea—*Lathyrus sativus*), where he acted as one of the coordinators. The obtained funds allowed the reinforcement of international Southeast Europe (Serbia) and Mediterranean (Portugal) regions collaborative research on grass pea specially among the younger researchers. One of the targeted topics of this bilateral project was grass pea biodiversity characterization and use in both countries with the recovery of numerous locally cultivated and maintained landraces, and compilation of traditional ways of cultivation and use in close collaboration with the local farmers. The other topic was the study of grass pea germplasm response to abiotic stresses, especially to drought and low temperatures. This bilateral collaboration allowed PhD students and early career researchers from both teams to share their knowledge and expertise on grass pea research and established a network that would accompany them through their scientific lives.

5 | LEGUME-BASED INTERCROPPING

For more than 10 years, since 2005, together with colleagues from the University of Novi Sad and other researches around Europe, Dr. Mikić has been working on legume intercropping. Aleksandar significantly contributed to intercropping research activities with his unique invention, ideas, as well as original drawings and schemes (Cupina, Mikić, Krstić, et al., 2011; Cupina, Mikić, Stoddard, et al., 2011; Mikić et al., 2013, 2015; Marjanović-Jeromela et al., 2017). The novelty of that work provided a wider and long-term vision of future challenges in this specific cropping system and was primarily reflected in the carefully designed systems for two main forms of mutual legume intercropping in various environments (Mikić et al., 2015). He has great concern with a responsibility feeling for future generations, through management of legume cropping to mitigate and adapt to climate change (Duc et al., 2015). The first one is establishing perennial forage legumes (red clover, alfalfa, and sainfoin) with annual legumes, such as pea and vetches, where the latter acts as a bioherbicide and concurrently contributes to the total forage yield in the first cut of the former. Another form is intercropping annual legumes with each other respecting the same time of sowing, that is, in fall or in spring, similar growth habit, especially stem length, time of maturity for cutting or harvest and that one component has good standing ability and supports the other one that is susceptible to lodging (Cupina, Mikić, Krstić, et al., 2011; Cupina, Mikić, Stoddard, et al., 2011; Mikić et al., 2012, 2015; Zorić et al., 2012). Aleksandar also participated in designing of a scheme for annual legumes with *Brassica* species for ruminant feeding and green manure (Marjanović-Jeromela et al., 2017). Apart from forage, this research promoted legume intercropping for grain production (Mikić, Rubiales, Smýkal, & Stoddard, 2011). Having in mind that Aleksandar was basically an annual legume breeder, he released several forage and grain pea varieties; some of them are fitting for legume intercropping from different points of view (Mikić et al., 2012).

6 | ASTERIX, ARCHAEOLOGY, AND ARCHAEOBOTANY START WITH AN A

The last paper Aleksandar Mikić has contributed was about Celtic archaeology. It was published only a week after his death (Medović et al., 2021). Aleksandar's passion for the cartoons of Asterix and Obelix has introduced him into the magic world of archeology and archaeobotany. His contribution to the latter was significant. It was his idea to try the extraction of the ancient DNA from charred pea and bitter vetch seeds found at the archaeological site of Hissar in South Serbia (Jovanović et al., 2011; Medović et al., 2011). A multidisciplinary team of scientists that he managed to bring together has continued the research on the charred pea (Smýkal et al., 2014). It placed it at an intermediate position between extant cultivated pea (*Pisum sativum* subsp. *sativum* var. *sativum*) and a wild, winter hardy, "tall" pea (*P. sativum* subsp. *elatius*). It was assumed that the pea that grew on the plots of the ancient farmers at Hissar, more than three millennia ago, had colored flowers and the pigmented seed coat, similarly to today's field pea (*Pisum sativum* subsp. *sativum* var. *arvense*). The work on charred pea from Hissar has ended with an archaeoentomological paper (Medović & Mikić, 2021). The pea species/variety found at Hissar was not resistant to a weevil attack, most probably to *Bruchus pisorum*. Based on an assumption of peas late harvest time and combined with pea weevil life cycle stage in charred seeds, it was possible to estimate the season during which the seeds were carbonized, namely, the second half of July or the first days of August at the latest. This is one of the most precise dating in the archaeobotany.

7 | BROADER INTERESTS

Aleksandar was a prolific writer not only of scientific papers but also books like the Lexicon of Pulse Crops and Haiku Poems about legumes, and even cartoons of Asterix or other characters focusing on legume-based stories!

In the last years, Aleksandar suffered the effects of a disease that progressively erased his ability to work. Despite that, he still managed to occasionally contribute to ILS in various ways. We will miss Aleksandar and his bright, innovative ideas (Figure 2). As a tribute to Aleksandar as a poet and a scientist, we retrieve his "Lady of Legumes" poem from Grain Legumes 54 (2009) for all of you.

Inwitári! Of Legumes Dame!
I sing to praise thy noble name.
Slender thou art, a stem of vetch;
Firmly thy grace my heart did catch.
The steps of thine are gentle and light,
Leaving a trace of clover white.
The hue of thy hair is gold pure
Like a grain of soybean mature.
The lips like thine none's ever seen,
Purple as pods of lablab bean.



FIGURE 2 Aleksandar entering paradise

Stars in thy eyes fall in showers,
 Small and bright like lentil flowers.
 Thy soul is fresh, fragrant and neat
 As a garden full of pea sweet.
 Like a firebird with flaming plumes
 Thy beauty is, Lady of Legumes.

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