The ecophysiological needs of plums and their impact on ecological production of plum in Bosnia and Herzegovina

Abstract

Organic farming takes up more and more areas in agricultural production. It is based on the principles of preserving human and animal health and maintaining the balance in agrobiocenosis and therefore prohibits the use of a majority of water-soluble mineral fertilizers and phytopharmaceuticals of chemical origin (except those from the list of allowed products). In ecological farming of plums, optimization of fertilization is very important, which must comply with ecological principles and regulations which included fertilization with a relatively narrow range of allowed organic fertilizers (manure, compost, manure, slurry, peat, guano, sawdust) and mineral additives (calcium carbonate, crude phosphates, basic slag, raw potassium salt, potassium sulphate, gypsum, wood ash, calcium chloride, sodium chloride, etc.).

Nutrition methods in organic plum production is different from nutrition in conventional production, primarily due to limited selection of available fertilizers, and the most important difference is the inability to use water soluble individual and complex fertilizers. It is precisely for this reason that in organic agriculture, the emphasis on maintaining humidity, optimum pH and soil moisture is considerably more important than necessary prerequisites for sufficient availability of nutrients in the soil.

Keywords: Ecological plum production, fertillization optimization, keeping humility, organic fertilizers.

1. INTRODUCTION

Plum in Bosnia and Herzegovina is a national fruit. In the last century, ex-Yugoslavia was one of the largest plum producers with 18% of world production, but over time, plum lost the economic importance it once had. Nevertheless, it is today the most widespread fruit culture on the territory of Bosnia and Herzegovina. According to the National Directorate of Statistics (2006), in Bosnia and Herzegovina there are 10.9 million plum trees with an average yield of 9.3-9.5 kg per tree.The fruit of plum is rich in vitamins and abundance of minerals, pectin and organic acids, and occupies a very important place in human nutrition. It is a good antioxidant, and its anthocyanins can provide human protection against oxidative stress. Fruit plums contain 75 to 87% water and 13 to 25% dry matter. The taste of the fruit depends on ratio of sugar and organic acids. In the fruit of the plum predominates glucose, while it is less fructose. Among the acids most are malic and citric. The total amount of organic acids expressed as malic acid ranges from 0.39 to 2.28%. The percentage of acids and sugars varies with the same variety, depending on climatic and soil conditions. In the mature fruit of plums the pH value ranges from 3.3 to 3.6.

The fleshy part of the plum of the plum contains up to 0.69% of pectic substances, which are important in the technology of jellies, marmalades and similar products. Nitrogenous substances participate in the chemical composition of the fruit with 0.6 to 0.8% (amino acids, amides, ammonia compounds and nitrogen bases), and minerals with only 0.5%. Of the mineral substances, the highest is potassium (54.59%) and phosphorus (17.7%). Plum fruit contain large amounts of fat (Mitrović Olga et al., 2009).

Bosnia and Herzegovina fulfills the basic geographical and climatic preconfition for plum cultivation, and the remaining attention is paid to the technology of breeding, and most of the nutrition and protection of plums. The plum lives and yields on the same land for 30-50 years, and in some cases even longer. Through this relatively long period, plum with its root system from the soil, take out large amounts of nutrients are available in the form that are necessary for the growth and development. Particular accent is given to the high yielding as a necessary factor for the production process. A very important factor of cost-effective production is the maintenance of soil fertility, but sometimes the soil does not have the optimal amount of nutrients for the plant, so it is necessary to provide agricultural land with the help of agro-technical measures by fertilizing the nutrients in the soil or plant nutrients by foliar application.

The repair of chemical, physical and biological characteristics of the land should be done by the analysis of the soil, in compliance with the rules of the agronomic profession in accordance with modern plum cultivation technologies. Applying modern knowledge about plum cultivation technology, while adhering to already known principles of sustainable agricultural production and processing technology, plums can result in growing plum production and revitalizing the status of an economically significant culture. A study of agroecological and technological characteristics of production with the soil conditioning plan and fertilization plan prior to planting and the fertilization plan for the future plum planting, significantly contributes to the sustainable ecological production of plums in Bosnia and Herzegovina, which could quantitatively and qualitatively realize the great potential of placing on the market of organic products.

Organic production is a complete food production management system that combines the best ecological practices, a high degree of biodiversity, the conservation of natural resources, the application of high animal welfare standards and the way of production in line with consumer expectations, using natural substances and processes.Organic production has a dual social role. On the one hand, it provides public goods that contribute to the protection of the environment and animal welfare, and on the other, contributes to the development of rural areas (EC Regulation 834/2007). Organic agriculture is a specific agricultural production system that represents a systematic and comprehensive approach to sustainable survival, taking into account factors that influence sustainable development and vulnerability at the physical, economic and socio-cultural level (Eyhorn, 2007). Therefore, organic production can significantly contribute to the development of rural communities (Lobley et al., 2005; El-Hage Scialabba and Hattam, 2002; Eyhorn, 2007).

At the same time, organic food can respond to increasingly lucrative consumer demands for healthy, quality and safe food, whose production will not impair water and soil quality, biodiversity and animal welfare. Therefore, it is classified as a higher quality food. According to Little and Frost (2008), the main elements of organic production systems are:

• Good soil management leading to good fertility, maintaining high content of organic matter, high microbiological activity and good land structure,

• Well-designed crop rotation that are important for balanced crop nutrition, weed control and minimize disease and pest problems,

• Preventive, not chemical, approach to controlling weeds, diseases and pests,

• Profitable contribution of organic cover crops and livestock.

The aim of the paper is to analyze the ecophysiological needs of plums according to agroecological factors, establish the needs of nutrients in organic production of plums, define the advantages and disadvantages of plum ecological nutrition, define the possibilities for self-sustaining ecological production of plums. The analysis would have a contribution in the field of agriculture, nutrition of plants and organic agriculture, as well as the use of this work in further detailed research of plum nutrition in organic production.

2. MATERIAL AND METHODS

For this work the data of the Federal Hydrometeorological Institute of BiH were used for: temperature, precipitation and insolation for 2017. Data were processed for the whole of BiH, but the accent was placed on the territory of the Tuzla Canton. For temperature it is described average air temperatures, average annual temperatures, temperature deviations and based on this is given a conclusion on whether and how much it affects plum cultivation.According to the distribution of percentile, rainfall conditions in 2017 were classified into categories (10-25 percentiles), normal (26-74 percentiles), rain (75-90 percentiles) and very rainy (> 98 percentile). Months with the highest precipitation are shown, as are the months with the least amount of precipitation and extreme values.Measured both the number of hours of sunshine and the number of sunny days.On the basis of the obtained data from the Federal Hydrometeorological Institute as well as the soil conditions in BiH and the Tuzla Canton area, the state and possibilities of ecological production of plums in BiH as well as the orientational standards of fertilization of plums in organic farming are taken into consideration in the principles of ecological agriculture. A study for nutrient requirements in the production of plums was made on the basis of literature and source data.

3. RESULTS AND DISCUSSION

3.1. Temperature

During deep winter hibernation plum tolerate absolute minimum temperatures even below -30 ° C. In the opening phase of the flower buds, the flowers can be demaged at -1 ° C to -5 ° C, and in the full flowering phase, frost is expected at temperatures from -0.5 ° C to -2.2 ° C. As with other fruiting species, small fruits are still sensitive, and they suffer at temperatures of -0.5 ° C to -2 ° C. The quality of the fruit most depends on the average temperature during June, July and August. If the average temperatures are 18 - 20 ° C these months then these areas are excellent for the production of plums (Ivo Krpina et al., 2004). Average annual air temperatures in 2017 were considerably above the standard normal value (1961-1990) throughout the observed territory of Bosnia and Herzegovina. The average air temperatures ranged between 10.4 ° C in Bugojno and 16.0 ° C in Mostar, on the mountains between 1.8 ° C on Bjelašnica and 8.2 ° C on Ivan Sedlo. Temperature deviations ranged from 0.6 ° C to Bjelašnica to 2.1 ° C in Gradačac (Table 1.). The spatial distribution of average annual temperatures in Bosnia and Herzegovina is shown in Figure 1. As for temperature conditions in Bosnia and Herzegovina, we can conclude that the average temperatures do not indicate bigger problems for plums or deviations of 0.6 ° C on Bjelašnica to 2,1 ° C in Gradacac are not a major problem in the plum production.

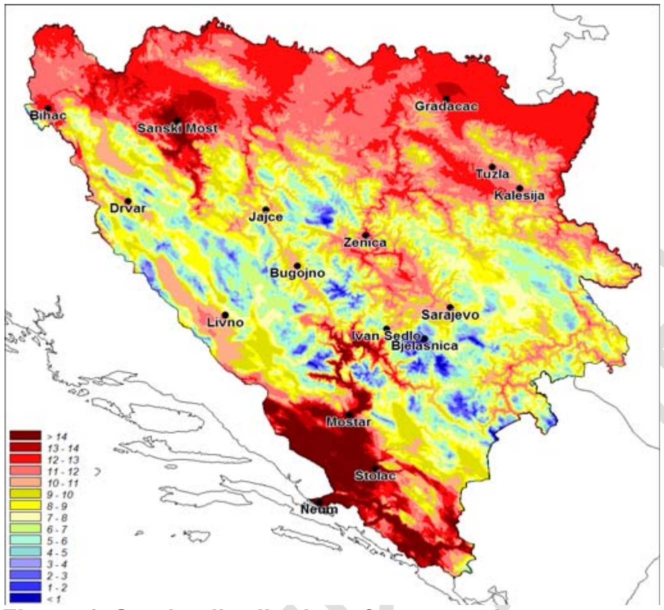

Figure 1. Spatial distribution of average air temperature

Table 1. The deviation of the average annual air temperature related to the climatic standard normal and the associated percentiles

STATION	ANOMALY	PERCENTILES	STATION	ANOMALY	PERCENTILES
BIHAĆ	1.8	100	Livno	1.3	100
BJELAŠNICA	0.6	91	Mostar	1.5	100
BUGOJNO	1.6	100	Neum	///	///
DRVAR	1.4	100	Sanski Most	1.6	100
GRADAČAC	2.1	100	Sarajevo	1.4	100
IVAN SEDLO	1.0	99	Stolac	1.2	100
JAJCE	1.1	100	Tuzla	1.5	100
KALESIJA	1.5	100	Zenica	1.7	100

3.2. Precipitation

For the cultivation of plums, the annual amount of precipitation, as well as their distribution during the year, are a very important factor. For normal growth, development and fruiting of the plum it is necessary that the soil be sufficiently humid during the entire vegetation period. Most plum varieties are best managed in regions with an annual rainfall of 700 to 1000 mm (with a fall of 350-600 mm in the vegetation period) and relative humidity of 75-85% (Mišić, 2006). The critical boundary for plum cultivation is 600 mm precipitation per year. However, the amount of this quantity depends on several factors, primarily on the layout of precipitation, soil properties, temperatures in the course of vegetation, etc. (Ivo Krpina et al., Voćarstvo, Zagreb, 2004). In BiH, in the so-called plum area (areas where there is a tradition of plum cultivation in which favorable agronomic conditions for plum cultivation such as Gradačac, Čelić, Srebrenik, etc.) fall more than 800 mm of precipitation. The analysis of annual rainfall amounts expressed in % of the average values shows that in 2017, deviations in relation to the perennial average (1961-1990) ranged between 83.7% in Mostar and 116.2% in Bihac. Total rainfall in 2017 was in the range of 825.4 mm at the meteorological station Gradačac to 1522.6 mm at the meteorological station Bihać (Table 2).

Table 2. The deviation of the average precipitation sum related to the climatic standard normal and the associated percentiles

STATION	ANOMALY	PERCENTILES	STATION	ANOMALY	PERCENTILES
BIHAĆ	116.2	89	Livno	92.2	33
BJELAŠNICA	108.7	58	Mostar	83.7	17
BUGOJNO	110.1	74	Neum	///	///
DRVAR	94.2	38	Sanski Most	107.5	70
GRADAČAC	94.3	32	Sarajevo	100.6	47
IVAN SEDLO	94.8	38	Stolac	80.0	12
JAJCE	107.8	60	Tuzla	113.1	94
KALESIJA	139.5	90	Zenica	113.0	87

December and September were the months with the highest rainfall in 2017, while August was the month with the smallest amount. At the meteorological station Mostar in August, 4.8 mm of precipitation was measured, while in Bihać in September it was measured 335.0 mm, which is the largest monthly sum in 2017 at one station.In the inhabited areas, the highest height of the snow cover was measured in Bihać 54 cm (18.01.), While in the mountainous areas (Bjelašnica) 113 cm (11.03.) Was recorded.
The number of precipitation days ≥1.0 mm in 2017 ranged from 76 in Mostar to 131 days at the Ivan Sedlo meteorological station. Most days with rainfall ≥1.0 mm was registered in December and April and at least in August. Most days with precipitation ≥ 10.0 mm were recorded at the weather station Ivan Sedlo (48), and at least at the meteorological station Gradačac (26). In September, most days were recorded with precipitation ≥ 10.0 mm, and in August on most station there were no precipitation days ≥ 10.0 mm. As for Tuzla, there were 96 days with precipitation ≥ 1.0 mm, with precipitation ≥ 10 mm 35 days and precipitation ≥ 20 mm for 16 days. (Federal Hydrometeorological Institute of BiH) (Table 3).

Table 3. Number of days with characteristic rainfall, snow cover and maximum snow cover height

PADAVINE	≥ 1.0 MM	≥ 10.0 MM	≥ 20.0 MM	NUMBER OF DAYS > 1 CM	MAX HEIGHT
STATION	2017. number of days	2017. number of days	2017. number of days	2017. number of days	cm
SARAJEVO	113	30	15	70	39
MOSTAR	76	40	22	0	0
BIHAĆ	110	45	26	45	54
TUZLA	96	35	16	49	26
BJELAŠNICA	128	37	17	211	113

3.3. Insolation

The number of hours of sunshine (insolation) in 2017 was higher in all analyzed stations compared to the thirty year average (1961-1990). Less hours of sunshine (1986) were recorded at the meteorological station Bjelašnica, which is 342 hours more sunshine than the perennial average. Most hours (2694) were recorded at the meteorological station Mostar, or 340 hours more sunshine from the perennial averages (Figure 2).The largest deviation was recorded at the meteorological station Bihac, where during 2017 there were 590 hours of sunshine more than average. The lowest deviation of the sunshine relative to the perennial average was recorded in Mostar (Table 4).

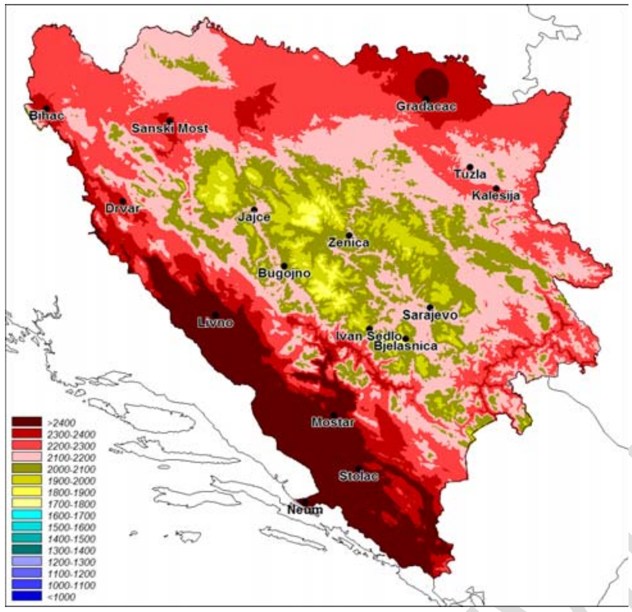

Figure 2. Spatial distribution of insolation (h) in 2017

The most pronounced monthly positive deviation of the sunshine expressed in% of the average values relative to the reference series (1961-1990) was registered in January at the meteorological station Sarajevo. The number of hours of sunshine at the meteorological stations in Sarajevo was 198% higher than the average, and 113 hours of sunshine were recorded. The most pronounced monthly negative deviation of the sunshine was recorded in December at the meteorological station Bjelašnica. Bjelašnica recorded 60 hours of sunshine, which amounts to about 72% of the average value.

Table 4. Number of hours of sunshine in 2017

STATION	NUMBER OF HOURS OF SUNSHINE COMPARED TO PERENNIAL AVERAGES
MOSTAR	340 hours more compared to perennial averages
BIHAĆ	590 hours more compared to perennial averages
BJELAŠNICA	342 hours more compared to perennial averages

Regarding the meteorological data for Bosnia and Herzegovina, they are not a major problem for the cultivation of plums. From the data we see that the temperature, precipitation and sunshine correspond to the ephophysiological needs of the plum. Problems occur in droughty years or in years when precipitation is increased.

3.4. Necessary amounts and concentrations of nutrients in plum production

For normal life of the plums, as well as other green plants, 17 biogenic elements are necessary (Nešković et al., 2003). Biogenic macroelements plants are adopt and accumulate in large quantities, and other biogenic elements (Fe, B, Zn, Mn, Mo, Cu, Cl, Ni), i.e. microelements are used in smaller quantities. Biogenic macroelements primarily are used as building materials, and biogenic microelements as biocatalysts in the plant. Plum tree is supplied with carbon, hidrogen and partly oxygen via photosynthesis, while other biogenic elements come from the soil. However, the above-ground organs of the plant, especially the leaf, can absorb biogenic elements with the so-called leaf nutrition. In this way, plant can adopt the necessary nutrients. Plum leaves are the richest mineral plants organs, followed by buds and fruits (Table 5 and 6).

Table 5. Quantities of macroelements expressed in% of dry matter in various plum organs (Sarić, 1975. I Childers, 1969.)

NUTRITION	FRUIT	LEAF	SPROUT	BUDWOOD	TREE AND BRANCHES	ROOT

N %	0,71-1,20	1,80-2,10	0,43	0,97	0,37	0,34
P_2O_5 %	0,22-0,30	0,33-0,60	0,10	0,27	0,09	0,10
K_2O %	1,41-2,27	1,80-3,00	0,23	0,43	0,21	0,21
CAO %	0,11	2,80-5,60	0,84	2,31	0,63	0,59

Table 6. Optimal quantities of biogenic elements in normal plum leaves (in mg per kg of dry substance) in August (Childers, 1966.; Westwood, 1978.; Faust, 1989.)

ELEMENT	CHILDERS (1966.)	WESTWOOD (1978.)	FAUST (1989.)
N	25.300-30.000	22.000	25.000
K	8.400-46.600	14.000	25.000
CA	27.800-51.600	10.000	25.000
P	550-770	1.200	2.000
MG	26.900-29.400	2.400	4.000
S	2.200-4.700	-	-
FE	-	50	120
MN	53-93	25	50
ZN	-	18	30
B	33	35	35
CU	7-10	4	10

The amount of biogenic elements in the normal plum leaves (Table 6) ranges from 4 mg for copper to 51,600 mg per kilogram of dry calcium. For normal growth and fruiting, the same amount of copper is as important as 12,900 times more calcium.The plum root receives mineral matter dissolved in water in the form of ions (anions and cations) by diffusion, osmosis and contact ion exchange. The absorption and content of mineral substances are influenced by: the selective permeability of protoplasm in the absorption root zone, temperature, pH, antagonism and synergism between anion and cation, aeration, stage of individual plant development, phenofase in the annual plum cycle, and the organ of the plant receiving mineral substances.When the concentration of nutrients is above the level of good supply, there is no need for fertilization to increase availability, as economically justified results will not be obtained. In that sense it is very important to interpret the results of soil analysis well.

3.5. Organic fertilization and soil

Some studies (Blanco-Canqui et al., 2017, Hondebrink et al., 2017, Shah et al., 2017) show that eco-systems of plant production function normally or in some aspects even better than conventional systems involving the use herbicides and other agrochemicals. The necessary soil stability in ecological agroecosystems is improved by the addition of organic matter through organic manure, compost, green manure, organic by-products on organic farms and well-designed crop rotation, that largely involve the sowing of cover crops and shamrock. The above mentioned agro-technical measures in practice mitigate the negative effects of soil treatment on the structure and quantity of organic matter, i.e. humus.Yagodin (1984) states that the continuous application of solid organic fertilizers improves the chemical properties of soil, increases the humus content, microbiological activity, and there is also a positive influence on water-air relations in the soil. Furthermore, the capacity to replace the bases and the saturation level of the adsorption complex with bases (Ca, Mg, K) increases, while the acidity slowly decreases, as is the amount of mobile Al, Fe and Mn. Application of organic fertilizers is one of the ways of removing the harmful effect of excessive acidity of the soil, primarily thanks to the mechanism of antitoxic activity. This mechanism is activated to a greater degree only during the many years of intensive application of organic fertilizers, when organic acids contained in organic manure block Al, Cu and other elements in the form of heavily soluble organic compounds, and organic acids form chelates with metals. Along with the mentioned effect of organic acids on reducing the toxicity of Al, Mn and other elements, and other substances from organic fertilizers, such as antagonistic elements (P, Ca, Mg, S, Si), they also have an impact on the suppression of toxicity.Continuous application of organic fertilizers allowed in organic agricultural production increases the amount of soil organic matter, reduces erosion, improves soil infiltration and aeration; improves the soil biological activity during the decomposition; and promotes long-term yield of cultures acting residually to release nutrients in the soil (Hati and Bandyoopadhay, 2011).

3.6. Plan for fertilizing a young plantation to full fertility

Young orchards are plantation at the stage of intense growth and fruit development. This is the stage from planting till it develops the basic skeletal branches, with the characteristics of the intended breeding form. This phase is shorter in intensive than extensive plantations. Young fruit trees should be regularly fertilized in order to foster faster growth and development. The correct fertilization depends largely on the rate of growth and the development of fruit trees. In the first and second year fruit is fertilized individually, and the fertilization zone around the fruit trees should be slightly wider than the crochet (Kantoci, 2012).The result plums fertillization depends predominantly on the biogenic element or other factor that is at a minimum (Mišić, 2006). The selection of fertilizers depends on the soil, climate and weather conditions, variety and plum substrate, crown shape and breeding system, growth and yield, nutrient consumption of plums, quality, composition and physiological activity of fertilizers (Mišić, 2006).When in the agromelioration all biogenic elements are brought to the proper level, the fertilization of plum K and P may be absent during the first few years of the care of a young plantation (Mišić, 2006). Otherwise, fertilization with N, P and K is carried out from the first year. The orientation norms of certain nutrients during the first three years of young sponge care are shown in Table 5 (Mišić, 2006).

Table 7. Orientation norms of individual nutritions (in g per tree) for fertilization of young plums

YEAR AFTER PLANTATION	N	P_2O_5	K_2O
FIRST	30	10	40
SECOND	60	20	80
THIRD	90	30	120

Depending on the soil properties, a greater or lesser part of nutrients from the fertilizer binds (immobilized) in forms that are hard to reach by fruit trees. For example, easily available phosphate (monoclation phosphate) is often bind to Fe or Al in the soil in a heavily accessible or inaccessible form (tetra and penta phosphate Fe or Al). While, N in the soil is easily subjected to rinsing processes, resulting in large losses if fertilization is not done gradually on several occasions (Kantoci, 2012).

Fertilization for medium high yield:

Average nutrient requirements for medium high yield are nitrogen (N) 90 kg / ha, phosphorus (P_2O_5) 50 kg/ha and potassium (K_2O) 140 kg/ha. In the autumn after harvest, it is necessary to give from 390 kg/ha of NPK 6-18-36 (or 1 kg/tree), in March 100 kg/ha urea (or 0.4 kg/tree), and in May 60 kg/ha of KAN (or 0.3 kg/tree), (Pavlović., 2016.) (Table 8).

Table 8. Average nutrient requirements for medium high yield

PERIOD OF YEAR	KIND AND QUANTITY OF FERTILIZER
AUTUMN	NPK 6-18-36 390 kg/ha
MARCH	UREA 100 kg/ha
MAY	KAN 60 kg/ha

Foliar nutrition should be carried out on two occasions (or more in case of a more expressed deficit of microelements):
- before blooming: 0.5% solution foliar preparation on Boric (B) base
- after blooming: 1 to 2% solution of foliar preparation with macro and micro elements (Pavlović, 2016).

Fertilization for high yield:
Average nutrient requirements for high yield are nitrogen (N) 160 kg/ha, phosphorus (P_2O_5) 90 kg/ha and potassium (K_2O) 250 kg/ha. In the autumn after the harvest, it is necessary to give 680 kg/ha

NPK 6-18-36 (or 1.7 kg/tree), in March 180 kg/ha urea (or 0.5 kg/tree) and in May with 100 kg/ha KAN (0,4 kg/tree). (Pavlović, 2016.) (Table 9).

Table 9. Average nutrient requirements for high yield

PERIOD OF YEAR	KIND AND QUANTITY OF FERTILIZER
AUTUMN	NPK 6-18-36 680 kg/ha
MARCH	UREA 180 kg/ha
MAY	KAN 100 kg/ha

On lime soil it is recommended that in the autumn after harvest you give 830 kg/ha NPK 5-20-30S (or 2.1 kg/tree), in March 175 kg/ha urea (0.5 kg/tree), and in May 100 kg/ha of AN (0.3 kg/tree) (Pavlović G. 2016.).

For organic fertilizers can be used compost, vermicompost, slurry, manure, rigid cow manure, solid chicken manure, rigid horse manure, rigid pig manure and chicken dry manure . Each of them has different ranges of nutrient concentration. Range of nutrient concentrations are different due to the different proportions of the litter of these solid and liquid excretions. The litter has a lower N content, but absorbs a large amount of liquid secretions and increases the concentration of N and K, which are mainly excreted in the urine. The extracellular extracts, however, contain mostly P, which is why the low concentration of P in the slurries (Lončarić, 2015). Since the plum requires a large amount of nutrients, and the use of mineral fertilizers is not allowed in organic production, alternative solutions are used. Dry chicken manure is imposed as one of favorable solutions for soil with a lower level of available P because in 1 ton of dry chicken manure there is 30-38 kg N, 20-30 kg P_2O_5 and 20-22 kg K_2O (Lončarić, 2015). In solid chicken manure (in fresh state) the concentrations are slightly lower: 12-20 kg/t N, 12-14 kg/t P_2O_5 and 5-7 kg/t K_2O (Loncaric, 2015).On the other hand, for soil with lower K level is more suitable for organic fertilizer mixtures containing liquid manure (liquid manure) and plant waste (green mass, straw, corn) that are richer in K (eg composted mixtures of plant waste and manure).

4. CONCLUSION

The content of organic matter is an important factor in fertilizing plums. On the one hand, it provides the necessary nutrients, and now on the other hand it affects the physical and chemical properties of the soil. Organic matter of soil (humus) is the most important factor of soil elasticity. The amount of organic matter directly affects the fertilization needs. In the first year of breeding, in the basic fertilization of fruit with a thick assembly, it is fertilized by one fruit with 0.15 to 0.2 kg with some of the complex fertilizers (depending on the availability of P and K in soil) as NPK 7-20-30, NPK 6-18-36, NPK (SO_3) 7-14-21 or 0.1 kg NPK 8-26-26, NPK 10-30-20, NPK (MgO, SO_3) 7-14-21 . In the second year of cultivation fertilization is done at the same time and with the same types of fertilizers, with the amount increasing by 30 to 50%. In terms of nutrition in the fullfruiting phase, plum is significantly different from other types of fruit trees, because in addition to N, it requires large amounts of K in the soil. Fertilization is best done on the basis of chemical soil analyzes, nutritional status of plums determined by the analysis of leaves and the expected yield.The specificity of fertilization in organic agriculture is necessarily omitted from water-soluble mineral fertilizers, and the necessary nutrients are introduced into the soil by organic fertilizers and allowed additives (organic and/or mineral origin) from the list of permitted fertilizers in organic production. Orientation of this amount of available N in the soil is done by organic fertilizers with different N concentration ranges.It is used cow, chicken, pig, horse manure and dry chicken manure with the highest N content (30 to 38 kg/t N). Phosphorus and potassium are provided partly from the already mentioned organic fertilizers, and partly by the use of natural minerals or by-products such as phosphorites, Tomas phosphate, potassium sulphate, potassium chloride. Microelements are provided by organic fertilizers, as well as micro-fertilizers and preparations that are used by foliar or soil application in organic farming.

5. LITERATURE

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