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IMPACT OF DIFFERENT NUTRIENT SUPPLY LEVELS ON YIELD PARAMETERS OF ORGANIC KAPIA PEPPER IN PLASTIC TUNNEL

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Abstract: The use of commercially available, easily applicable, pelleted manure for nutrient supply has become a common practice of Hungarian organic vegetable growing farms, although information on nutrient mineralization of these products is limited. Our research investigated yield and several parameters of kapia pepper (*Capsicum annuum* L.) under different nutrient supply levels. The experiment was carried out in an unheated, 196 m² plastic tunnel on a certified organic farm. The soil was loam, pH(KCl) was 7.4, with humus content of 2.7%, low N, and high P and K content. The 'Kapirex' pepper plants were planted in 40+80×25 cm spacing in May 2022. Three nutrient supply levels were set up with increasing nutrient content in 4 repetitions. According to the results, a basic nutrient supply (22 kg/ha N) with manure pellet on soil with average humus content can achieve the average yield expected in organic farming, but lower quality can be expected. The intermediate technology (78 kg/ha N) with alfalfa pellets showed that it is worthwhile to choose alfalfa meal or other more rapidly revealing nitrogen sources instead of alfalfa pellets. The professional technology, with frequently repeated fertilization (126 kg/ha N), yielded only 3.6% higher. Still, there was a noticeable effect in early ripening, in higher number and size of fruits, but above average infestations of thrips species and Helicoverpa armigera.

Keywords: organic fertilizer, pepper, Capsicum annuum, alfalfa pellet, blood meal, manure pellet

1. Introduction

The use of commercially available, easily dispensable pelleted fertilizers for nutrient supplementation has become a common practice in organic farming in Hungary. However, little is known about their transformation processes and nutrient-supplying capacity. Organic growers usually manage the nutrient supply of peppers in a single application of compost or pelleted manure at planting because they cannot pay further attention to the differentiated nutrient supply of peppers in their diverse gardens during the season.

In addition, other forms of nitrogen supply beyond manure pellets are commercially available, such as blood meal and other pellets - these products are currently underutilized. Several investigations were carried out focusing on the effect

of organic fertilizers on pepper plants, e.g., farmyard compost, manures, vermicompost, fermented fish waste, chicken and cow manure (Amor 2006, Appireddy et al. 2008, Berova 2010, Zayed et al. 2013, Castellanos et al. 2017, Jamir et al. 2017, Khandaker et al. 2017, Reddy et al. 2017), however not all in organic farming conditions, and not investigating alfalfa products or blood meal. Alfalfa meal or pellets are widely used in the US (Stefankiw 2012).

In our research, we sought to answer the question of what differences occur in several parameters of kapia pepper that can be detected under different levels and forms of nutrient supply in organic growing production.

2. Materials and methods

The experiment was carried out on a certified organic farm at Zsámbok, Pest County, Hungary. The field was prepared at the beginning of 2022, with green fallow in the previous years. The soil texture was loam with pH[KCl] of 7.4, humus content of 2.7%, and $CaCO_3$ content of 1.2%. The initial soil sampling showed low nitrogen and high phosphorus and potassium content.

The 'Kapirex' pepper plants were planted in 80+40×25 cm spacing in an unheated, 196 m² plastic tunnel (7×28 m) on 5 April 2022. The beds were covered with PP ground covers with drip irrigation pipes running underneath. The plants were grown on two stems (10 stems/m²), and the shoots were trained on a support system. The experiment ended on 18 October 2022, resulting in a growing period of 167 days.

Three nutrient supply levels were set up with increasing nutrient content (see: *Table 1*). The plot size was 2.4 m² (3×0.8 m) in 4 replicates in a random block arrangement.

Table 1: The description of each treatment and applied fertilizers introduced

Treatment	Abbreviation	N kg/ha	Applied fertilizers
Farmers' control	GK	22	- at planting: 100 g/m² chicken manure pellet (NPK 4-2.5-2.3), 50 g/m² lime powder - during the season: no other nutrients were applied
Intermediate level technology	KSZ	78	- at planting: in addition to the GK, 150 g/m² alfalfa pellets (3% N content) - at the colouring of fruits (1x): 150 g/m² alfalfa pellets, 50 g/m² lime powder, 10 g/m² magnesium sulphate (bitter salt), 50 g/m² potassium sulphate
Professional technology	PR	126	- at planting: in addition to the GK, 50 g/m² of blood meal (13% N) - during the season: complex nutrient supplementation (10 g/m² blood meal, 5 ml/m² Kondisol, 10 g/m² lime powder, 5 g/m² magnesium sulphate, 0,5 g/m² Brexil Combi), applied every two weeks - at the colouring of fruits: 100 g/m² manure pellets, 50 g/m² lime powder

Source: Author's own editing

3. Results

The highest total weight was measured in the plots of professional technology (PR) (*Figure 1*). Still, this difference was not statistically significant, and there was not much difference in the average yield (kg/m²) values among treatments either (*Table 2*).

Figure 1: Total weight of kapia pepper fruits in all treatment (GK: farmers' control; KSZ: intermediate level technology; PR: professional technology)

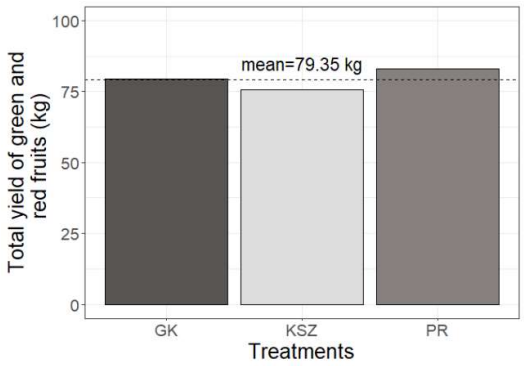


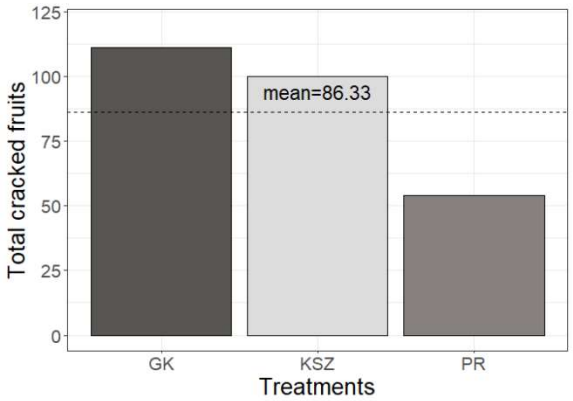
***Table 2*:** The average kapia pepper yield of different treatments (GK: farmers' control; KSZ: intermediate level technology; PR: professional technology)

Treatments	Average ± SD weekly yield (kg/m²)	Total yield (kg/m²)
GK	0.59 ± 0.48	8.27
KSZ	0.56 ± 0.42	7.89
PR	0.62 ± 0.52	8.64
Total	0.59 ± 0.47	8.26

The share of quality classes was similar across treatments, but the highest proportion of extra class fruits was found in the PR treatment (21.8%), of Class I was in GK (26.0%) and of Class II was in the KSZ treatment (17.3%). The waste class was almost equal in all treatments (8.0-8.3%).

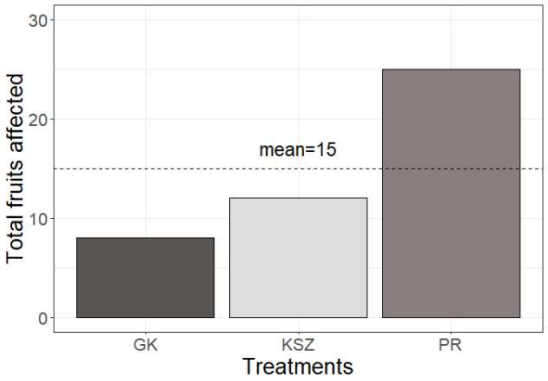
The treatments did not significantly affect the appearance of the calcium deficiency (=blossom-end rot) symptom. However, the number of cracked fruits was significantly affected. More cracked fruits were found in plots GK and KSZ, and the least in PR (*Figure 2*).

Figure 2: Number of cracked kapia pepper fruits in all treatment (GK: farmers' control; KSZ: intermediate level technology; PR: professional technology)



An interesting trend was observed in the appearance of pests. The treatments significantly affected the presence of *Thrips spp.* and *Helicoverpa armigera* caterpillar, where PR showed the highest infestation levels (*Figure 3.).*

Figure 3: Number of infected kapia pepper fruits by *Helicoverpa armigera* caterpillar in all treatment (GK: farmers' control; KSZ: intermediate level technology; PR: professional technology)



4. Discussion

Our experiment suggests that a basic nutrient supplementation can achieve the average yield expected in organic production in a field with moderate or good humus content. However, poorer quality is to be expected. In our experiment, the number of cracked and infected fruits was above average when only pellets were used at planting without further supply during the season.

It is worth choosing alfalfa meal or other more readily avaliable nitrogen sources instead of alfalfa pellets because nutrient release from pellets is slow. Besides, it negatively affected yield, quality class, and fruit quality.

The professional technology resulted in only a 3.6% yield increase with a much higher level of inputs but with a noticeable primary effect in the first two harvest weeks. There were higher numbers and larger sizes of fruits on PR plots, with the most Extra class peppers. More strict crop protection is required, as plants in better condition attracted thrips and *Helicoverpa* more, resulting in above the average infestations.

Acknowledgements

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