



The Determination of Nitrogen Demand of *Physalis* (*Physalis peruviana* L.) in Yalova/Turkey

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Abstract

Fruits of physalis are rich in vitamin A, B, C, iron, phosphorus and zinc. In recent years, growing *Physalis peruviana* L. is a new tendency in Turkey. However, there isn't any trial for nutritional demand of physalis in Turkey also. The main purpose of this trial is determining nitrogen demand of physalis. Furthermore determine to effect of nitrogen fertilization on some fruit quality. For this purpose six different nitrogen levels were used, 0 kg da⁻¹, 4 kg da⁻¹, 8 kg da⁻¹, 12 kg da⁻¹, 16 kg da⁻¹ and 20 kg da⁻¹. Optimum nitrogen level for maximum yield which 468 kg per da was 11,3 kg da⁻¹. In addition, yield, fruit diameter and plant high were affected from different nitrogen levels significantly also. The trial was carried out in 2013 in Yalova.

Keywords: Physalis, nitrogen, yield, fruit diameter, plant high

Güvey Fenerinin (*Physalis peruviana* L.) Azotlu Gübre İhtiyacının Belirlenmesi

Özet

Güvey feneri meyvesi A, B, ve C vitaminleri, demir, fosfor, potasyum ve çinko bakımından zengindir. güvey fenerinin Türkiye'de yetiştiriciliği son yıllarda artış göstermektedir. Fakat Türkiye'de güvey fenerinin besin maddesi isteği ile ilgili herhangi bir çalışma da bulunmamaktadır. Bu çalışmanın temel amacı güvey fenerinde farklı azot dozlarının verim, beslenme ve bazı kalite kriterleri üzerine etkisini belirlemektir. Bu amaçla azotun 0 kg da⁻¹, 4 kg da⁻¹, 8 kg da⁻¹, 12 kg da⁻¹, 16 kg da⁻¹ ve 20 kg da⁻¹ olmak üzere 6 farklı dozu kullanılmıştır. Maksimum verim için optimum azot dozu 11,3 kg da⁻¹ olarak belirlenmiştir. Ayrıca azot dozlarının verim, meyve çapı, bitki uzunluğu, üzerine etkisi önemli bulunmuştur. Çalışma güvey fenerinin azotlu gübre ihtiyacını belirleyebilmek amacıyla 2013 yılında Yalova'da yürütülmüştür.

Anahtar Kelimeler: Güvey Feneri, azot, verim, meyve çapı, bitki boyu

Introduction

P. Peruviana L. is a tropical fruit. The species of *P. Peruviana* L. are commercially known and grown up in many tropic and subtropic countries like South Africa, the U.S.A, New Zealand and Spain (Puente, 2010). However in Turkey, it is defined that it can be economically grown up under the mild climate conditions like the Marmara, Aegean and Mediterranean Regions (Beşirli 1998).

Physalis fruits are rich in A, B, C vitamins, phosphorus and iron minerals. Also, its carotene content is high. It is medically used for the cure of various diseases (antiseptic, diuretic, tranquilizer, helping for strengthening optic nerves, for throat problems, enterozoa and fight against ameba) in the countries it is grown up by people. (Rodríguez & Rodríguez, 2007). It has been informed that it is

commonly used for the cure of diseases like asthma, malaria, hepatitis and dermatitis, rheumatism in China (Fang 2010).

El-Tohamy et al. (2009) were studied on nitrogen demand of physalis in sandy soils in Egypt. They were investigated that yield, fruit number and fruit diameter were increasing with 20 kg da⁻¹ nitrogen fertilizer. Nitrogen content of plant, nitrogen fixation, plant height and number of leaves were increased with nitrogen doses. They were also found that using nitrogen was increasing fruit quality too.

Girapu and Kumar (2006) were used five different nitrogen level, 0-30-60-90 ve 120 kg ha⁻¹. They were tried to know effect of nitrogen level on yield, plant frequency and some plant properties of physalis. They were investigated that nitrogen uses

was important effect on plant height, number of leaves and brunches and volume of plant till 120 kg ha⁻¹. Results of this study the best nitrogen level was 90 kg ha⁻¹ and the best plant frequency was 60x60 cm.

Physalis has been tested in greenhouse growing in pots with the aim of observing nutrition disorders and deficiency symptoms of the plants has been identified with photographs (Martinez and ark 2009). It is determined that nitrogen, potassium and boron have a serious harmful effects on leaf structure and plant growth.

In counclusion of the study Miranda and friends. (2010) done about the tolerance of *Physalis* seeds from salt stress. They have stated that the rate of germination has not changed in 0, 30 ve 60 mM NaCl2 environment. Researchers have specified *Physalis* has medium level tolerance in the aspect of resistance to sodium.

Physalis is considerably new crop for Turkey. Demand for this crop has been much more than expected. No current market problems, high price of the product and proper for crop processing are reasons to prefer.

Associated with interest to the crop, some problems about cultural process have arisen. The most unknown of these problems is nutrition need. Our study is planned to cover the demand and identify the nitrogen nutrition of *physalis*.

Materials and Methods

The study was carried out in the trial field of Yalova Atatürk Horticultural Central Research Institute. In this trial, the number 1 genotype of *P.*

Peruviana L. has been used as a plant material and ammonium sulphate(%21) as a fertilizer source.

The healthy and well-grown seedlings which were planted into the viols at the beginning of March were taken to the land at the end of May .Row spacing 1.35 m., intrarow 1.0 m. was made in the land. The trial was made randomized blokcks with 4 repetitives. Plot size was 6,75 m x 10 m = 67,5 m² with 6 rows. In each plot, a total of 60 plants had been taken. The observations and measurements had been made from the plants in the middle row.

The half of the nitrogen fertilizer had been applied just before the planting and the other half before flowering. The 6 levels of nitrogen had been used as 0 kg da⁻¹, 4 kg da⁻¹, 8 kg da⁻¹, 12 kg da⁻¹, 16 kg da⁻¹ve 20 kg da⁻¹. According to the soil analysis there was no need to fertilize with phosphorus and potassium. The first harvest began on August 23 and six times harvest were done in total.

Results

Before subdivision and fertilizer application, soil samples had been taken and analyzed. Trial area is clay loam soil on texture. There is no problem in terms of salinity and lime. Soil reaction is slightly alkaline.

Plot soils are in medium level in terms of organic matter, exchangeable potassium and magnesium. The available phosphorus content of soil is high enough. Exchangeable magnesium, available iron and zinc levels are in good level. It is in a sufficient level in terms of available copper and manganese (Table 1).

Table 1. Results of study plot's soil analysis before planting (0-20 cm)

Texture (%)	EC ₂₅ (ds m ⁻¹)	pH	Lime (%)	Organic Matter (%)	Available Phosphorus (mg kg ⁻¹)	Exchangeable Potassium (mg kg ⁻¹)
52	0,16	7,42	0,62	2,09	26	160
Exchangeable			Available			
Calcium (mg kg ⁻¹)	Magnesium (mg kg ⁻¹)	Iron (mg kg ⁻¹)	Copper (mg kg ⁻¹)	Manganese (mg kg ⁻¹)	Zinc (mg kg ⁻¹)	
2963	253	16,27	5,68	5,11	2,56	

The first harvest was done when the color of external leaf transformed from green into light brown (in the early days of September). Then, harvest continued about every 10-14 days and in total 6 harvest were done. Measurements about yields were separately done in every harvest and

when the harvest was completely finished it was evaluated as cumulative total. Observation and measurements about plant characteristics were done at the 3rd harvest. The measurements about yield, plant and fruit characteristics are presented in Table 2.

Table 2. The effects of nitrogen fertilizer levels on yield, fruit diameter, fruit height, fruit stem height and plant height

Nitrogen (kg da ⁻¹)	Yield* (kg da ⁻¹)	Fruit Height (cm)	Fruit Diameter* (cm)	Fruit Stem Height (cm)	Plant Height* (cm)
0	345,23 d	2,16	1,97 b	2,47	73,08 d
4	410,09 bc	2,27	2,06 a	2,56	73,39 d
8	456,54 ab	2,23	2,05 a	2,57	81,60 c
12	471,59 a	2,21	2,04 a	2,58	83,82 bc
16	446,35 ab	2,25	2,06 a	2,68	87,95 ab
20	389,47 cd	2,23	2,07 a	2,65	91,10 a
CV	7,80	1,80	1,96	5,81	4,45

CV: Coefficient of Variation; * P<0,05; * Means with the same letter in a column are not statistically significant different from each other according to the LSD test at P≤0.01

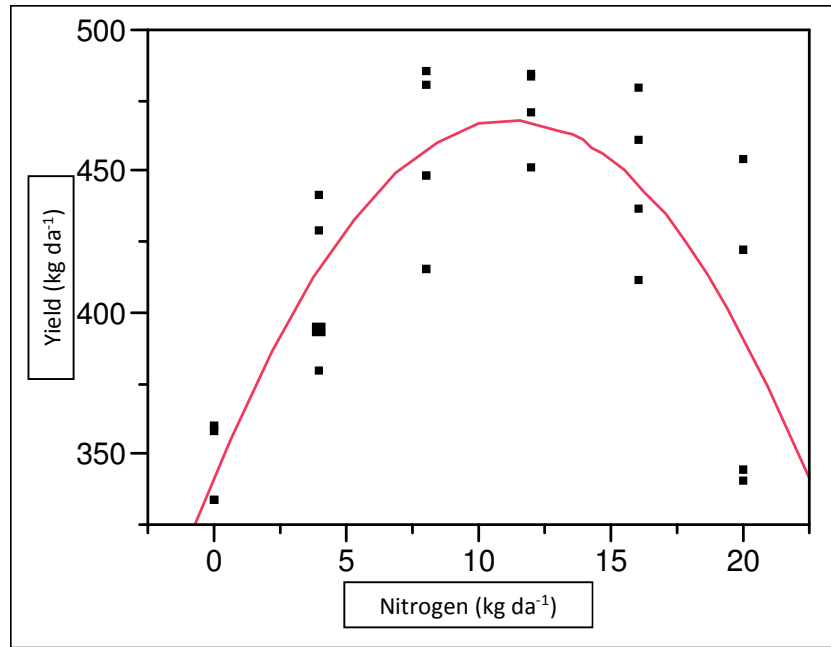


Figure 1. Relationship between nitrogen and yield

The practices have been considered as significant effect on yield, fruit diameter and plant height. As regards to evaluation of parcel yield, the practices have a significant effect on yield and the difference has been considered as important. In parallel with nitrogen practices, increases in yield have been identified and the relationship between yield and nitrogen has been formulated as

$$y = 341,94 + 22,44x - 0,99x^2$$

From this equality; economic optimum nitrogen dose has been calculated as 13,3 kg da⁻¹. When 13,3 kg nitrogen is applied to decare, the yield is identified as 468 kg da⁻¹. The difference in fruit

caliber measurement has also been regarded as significant, it is determined that fruit diameter has increased based on nitrogen. Plant height has increased in parallel with nitrogen fertilizer (Table 2).

Discussion

There are not many studies about *P. Peruviana L.*, especially studies aimed at fertilizer needs are limited. Recently, with this study, it is aimed to identify nitrogen fertilizer need of *P. Peruviana L.* whose farming has expeditiously increased in Turkey. The study was carried out at

Yalova Atatürk Horticultural Central Research Institute trial field in 2013. Against to nitrogen fertilizer, increases in yield rate have been identified. These increases are statistically significant. In other studies carried out in different countries, El-Tohamy and friends. (2009) ve Girapu and Kumar (2006) gained similar results. Girapu and Kumar (2006) has stated the ideal nitrogen dose as 90 kg ha⁻¹. In our study, however; in 468 kg da⁻¹, the ideal nitrogen dose for yield has been identified as 11,3 kg kg da⁻¹. Wolf (1991), on the other hand; has stated the inorganic fertilizing and yield as 440 kg da⁻¹ in his study.

Increasing nitrogenous manure studies have generated remarkable changes in fruit diameters and plant heights. However; the effect of nitrogen fertilizer studies on fruit heights and fruit stem height is insignificant. Likewise; both El-Tohamy and friends. (2009) and Girapu and Kumar (2006) stated that increasing nitrogen fertilizer studies have generated changes in fruit diameters, plant heights and plant's nitrogen content. Wolf (1991), nevertheless; informed that the usage of inorganic fertilizing and farm manure does not have a remarkable effect on the fruit quality.

Conclusion

In conclusion; according to datas of this study, to reach maximum yield (468 kg da⁻¹) for the year 2013, optimum nitrogen quantity for *P. Peruviana L.*, whose farming has expeditiously been trendy in Turkey, is determined as 11,3 kg kg da⁻¹.

Our study show that *P. Peruviana L.* can be economically grown up under the mild climate conditions like the Marmara, Aegean and Mediterranean Regions

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