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Investigation of the possible in Hydroponics Growing of Grass pea (*Lathyrus sativum* L.)

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ABSTRACT: Hydroponics is an agricultural technology and practice that can help feed the cities of the future while meeting customer demands and ensuring the health of ecological systems that sustain a livable world.In response to an ever increasing global demand for food and feed resources and to need to diversify modern cropping systems, the legume genus Lathyrus is receiving increased attention by scientists. The aim of this study was to investigate possible in Hydroponics Growing of grass pea (Lathyrus sativum L.). This work was carried out at the physiology Lab at Research Center for Plant Science, Ferdowsi university of Mashhad. The climate change, increasing droughts, soil depletion and disease, excess fertilization, phosphorus scarcity, water pollution, chemical overloads, pollinator destruction, and biodiversity loss threaten our business-as-usual approach to food production. At the end of 45 day, some of the growth parameter such as Biomas, the length of root and shoot, number of leaf, leaflet, lateral shoot and leaf surface, wet and dried weight root and shoot, diameter shoot measured, then compared between control and treatment samples.The results of this study show we can Hydroponics Growing of grass pea that is no worry about soil-borne diseases or pests and there's no weeding. So the results of this study show may be applied to produce high-standard plant material all year-round in consideration of the possibility to control growing conditions and to stimulate secondary metabolism by appropriate manipulation of mineral nutrition.
Keywords: Hydroponics, Grass pea, Lathyrus, Growing, agricultural.

INTRODUCTION

Lathyrus sativus L., common name grass pea, is an annual pulse crop belonging to the Fabaceae family and Vicieae tribe (Biswas and Biswas, 1997). Grass pea has a long history in agriculture. It was first domesticated some 7-8,000 years ago in the eastern Mediterranean region and has a history of cultivation in southern parts of Europe, North Africa and across Asia. Grass pea is grown both as feed for livestock and as a grain crop for humans. It is an annual plant widely grown as a pulse crop and its dried seeds are harvested and consumed as a human food since ancient times. This plant is also commonly grown for animal feed and as forage. The crop is an excellent fodder with its reliable yield and high protein content. The plant is able to resist both drought and flooding, to adapt to a wide range of soil types, including the marginal ones, to grow in cool climates and at high altitudes. Compared to other legumes, it is also resistant to many insect pests (Tiwari and Campbell, 1996a; Tiwari and Campbell, 1996b; Berger et al., 1999; Sillero et al., 2005). Grass pea also plays an important role in farming systems by providing fertilizer (like other legumes, it fixes nitrogen from the atmosphere) and reducing pest outbreaks through intercropping with other food crops. Its low cost, low input nature makes it a prime feed crop. And, because of this hardiness, grass pea is often the only alternative to starvation when other crops fail. Nowadays, grass pea is grown for stock-feed and human consumption in Asia (Bangladesh, China, India, Nepal and Pakistan) (Campbell, 1997), in the Middle East (Iraq, Iran, Afghanistan, Syria and Lebanon) (Campbell, 1997), in Northern Africa (Ethiopia, Egypt, Morocco, Algeria and Libya) (Girma et al., 2011) and in Southern Europe (France, Spain and Italy) (Campbell et al 1994; Piergiovanni et al., 2011). In the Mediterranean marginal areas, several grass pea germplasm of Lathyrus sativus L. are present and, among them the edible seeds of plants grown in Valle Agricola, are well known for the local cuisine.Hydroponics most often refers to the science of growing plants without the use of soil. Nowadays, the natural way of growing plants reappears with hydroponics as the particular technique, which makes plant cultivation possible even in urban areas without the use of soil. With more and more people involved, hydroponic gardening develops rapidly these days. Plants are cultivated on a special

growing medium, and all the nutrients, required for growing, are supplied via specially formulated nutrient solution. The primary task of any growing medium, used in hydroponic gardens, is to support plants roots along with retaining water. The benefits, offered by hydroponics, are pretty simple, yet impressive: one can receive 200-1000% increase in yield with only half of time and space requirements in comparison to traditional soil horticulture. Absence of soil also results in protection of growing plants against pests, commonly living in soil. In hydroponic systems, plants receive all the necessary nutrients through nutrient solution and never suffer lack of water. The aim of this study was to investigate possible in Hydroponics Growing of grass pea.

MATERIAL AND METHOD

In order to study Evolution of the possible in Hydroponics Growing of grass pea (Lathyrus sativum L.) in an experiment physiology Lab at Research Center for Plant Science, Ferdowsi university of Mashhad. Plants were transferred to plastic containers (20 L) with a nutrient solution Nutrient solutions (Hoagland solution) were continuously aerated by an air-pump to keep it oxygenate and to maintain homogeneous the solution. The Hoagland solution is a hydroponic nutrient solution (Table 1.) that was developed by Hoagland and Arnon in 1950 and is one of the most popular solution compositions for growing plants (in the scientific world at least). The Hoagland solution provides every nutrient necessary for plant growth and is appropriate for the growth of a large variety of plant species (Hoagland et al, 1950). Each treatment was replicated three times. Nutrient solution was renewed weekly and the containers were watered if necessary. Plants were sampled after 28 days of treatment. Roots and shoots were separated and weighted. Roots were thoroughly rinsed in tap and distilled water. Then both shoots and roots were rinsed in distilled water for 2 min. Plant material was dried at 60 ^{o}C for 3 days. The data obtained were subjected to statistical analysis computer program «MSTAT-C, 1983 » and «ANOVA». For comparison, the average data used criteria Duncan (a, b, c, d, and e) at the 5% level of probability (Duncan, 1955).

RESULTS AND DISCUSSION

The climate change, increasing droughts, soil depletion and disease, excess fertilization, phosphorus scarcity, water pollution, chemical overloads, pollinator destruction, and biodiversity loss threaten our business-as-usual approach to food production.In recognition of these concerns, consumers and retailers are increasingly demanding safer, high-quality foods with less unpaid burden on our shared environment and public health the hydroponic food production industry is expanding at a rate that is set to outpace the 2014 IMF estimate of global growth by 80%.The worldwide market value of hydroponically produced food will show sustained strength with a 6.5% compound annual growth rate (CAGR) over the five-year forecast period 2013-2018, beating the IMF estimated growth forecast of 3.6% for 2014. Producer value will increase from $17.7 billion to $24.3 billion. Hydroponics systems are being deployed to grow key vegetable and fruit crops at scale, driving the transition to safe and sustainable food production worldwide. Agriculture is traditionally a conservative market sector, but the benefits of higher yields with lower inputs, improved soil and water quality, and food safety are compelling forces for change(Stimmel, 2013).A hydroponic greenhouse can cost anywhere from 2 to 20 times more than soil-based farming and even more with some ultramodern technologies that are gaining ground in the urban food production wave. As the result, hydroponic plants concentrate on producing fruits instead of growing large roots to extract water and nutrients from the soil. This allows increasing the density of plants in your garden. It is also a proven fact, that food products, produced in indoor hydroponic systems, are cleaner and have longer shelf life. All the required nutrients are supplied through nutrient solution.The benefits, offered by hydroponics, are pretty simple, yet impressive: one can receive 200-1000% increase in yield with only half of time and space requirements in comparison to traditional soil horticulture. The results of this study show we can Hydroponics Growing of grass pea (Figure 1.) that is no worry about soil-borne diseases or pests and there's no weeding. So the results of this study show may be applied to produce high-standard plant material all year-round in consideration of the possibility to control growing conditions and to stimulate secondary metabolism by appropriate manipulation of mineral nutrition.

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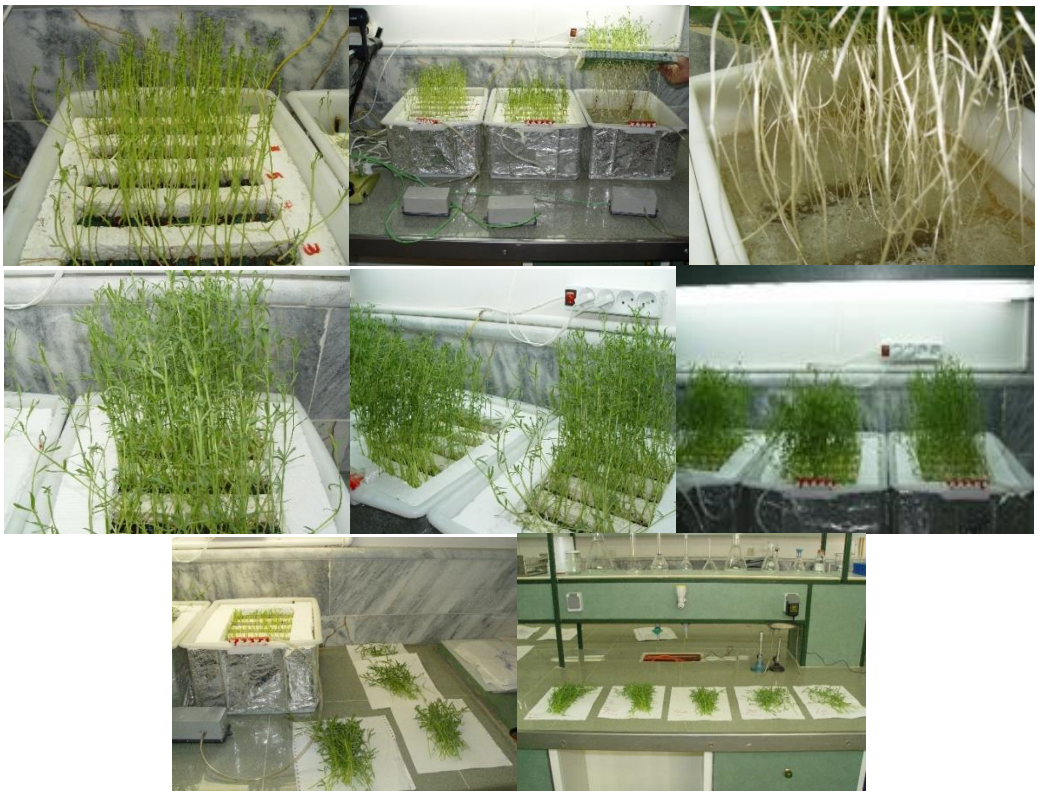

Figure 1. Hydroponic culture can produce large amounts of root and shoot biomass. These roots would undoubtedly be restricted if grown in conventional pot or tray systems

Table 1. Concentration of individual macronutrients and micronutrients available

Component	Stock Solution	mL Stock Solution/1L
Macronutrients		
2M KNO_3	202 g/L	2.5
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2M $Ca(NO_3)_2 \cdot 4H_2O$	236 g/0.5L	2.5
Iron (Sprint 138 iron chelate)	15 g/L	1.5
2M $MgSO_4 \cdot 7H_2O$	493 g/L	1
1M NH_4NO_3	80 g/L	1
Micronutrients		
H_3BO_3	2.86 g/L	1
$MnCl_2 \cdot 4H_2O$	1.81 g/L	1
$ZnSO_4 \cdot 7H_2O$	0.22 g/L	1
$CuSO_4$	0.051 g/L	1
$H_3MoO_4 \cdot H_2O$ or	0.09 g/L	1
$Na_2MoO_4 \cdot {}_2O$	0.12 g/L	1
1M KH_2PO_4 (pH to 6.0)	136 g/L	0.5