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Tomato Cultivation on Coconut Husks Substrate

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Abstract: The success of horticultural product is mainly based on the behavior of the plants growing in different media. Better media results in higher yields and improved crop quality. Coconut husk has shorter fibers, composted down to give a successful growing medium. As an alternative to peat or rock wool it offers a high moisture to air retention capacity, which enables easy growth and well spread root system. The pH ranges from 5.2 to 6.8. The compressed medium expands eight to nine times.

Tomato cultivar Bella and Sinatra was used for testing. Crop spacing was 3 plants per square meter. There were three plants per bag and media volume was 12.5 l, and one plant per pot (media volume 2 l). The coco blocks of tomato plants were transferred on to the top of the bags and hooked to drip irrigation system equipped with injector ratio feeding system. The fruit yield and harvest date results indicate that both media were comparable. Cultivar Belle had the total yield of marketable fruits on the coco bag 12.62 kg/plant, on the pot 13.52 kg/plants and higher than cultivar Sinatra.

It appears from this study that coco coir is a suitable growing medium for the production of tomatoes under greenhouse conditions.

Key words: tomato, glasshouse, coconut husks substrate

Introduction

Commercial greenhouse vegetable crop production in e.g. D.G: Promet, Magadenovac, Croatia, involves cucumber, pepper and tomatoes. Growers always keep on finding a new and improved media, lower cost in labor and production. Conventionally peat and peat based media, rock wool and saw dust from spruce and pine have been used. Both pepper and tomato crops are grown for ten to eleven month period and cucumber is on a two to three crops cycle per year. The replacement cost of media after each year or every other year adds on

and thus influence the price of the product. Even if the growers do not want to replace the media on a yearly basis the crop quality and fertilizer and water management generally dictates that the media needs to be replaced. Smaller growers who had tried to get away from replacing the media after two years have faced serious problems with media compaction, shrinkage, poor porosity, water logged conditions resulting from lower air to water ratio, decomposing and rotting roots left from previous crops, accumulation of salts and imbalance of ions elevated disease and insect pest levels.

Finding a suitable media which offers advantage over all the above problem makes good commercial sense.

The success of horticultural production is mainly based on the behavior of the plants growing in it. Better media results in higher yields and improved crop quality. Coconut husk has shorter fibers, composted down to give a successful growing medium. As an alternative to peat or rock wool it offers a high moisture to air retention capacity, which enables easy growth and well spread root system. The pH ranges from 5.2 to 6.8. The compressed medium expands eight to nine times.

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Material and Methods

Tomato seeds were germinated in 2.5 cm propagation cocoplugs at 25°C in a growth room without light. The germinated seedlings were transferred to glass greenhouse and were exposed to eighteen hours of light from high pressure sodium lamp of 400 watts capacity. The light at plant surface was measured at 8000 lux. The seedlings were fertilized with a complete macro and micro nutrient solutions at an E.C of 1.5 ms/cm during this period. After one week the seedlings were transplanted to ten cm coco blocks and were fertilized with a complete solution at an E.C of 4.5 to 5. The light period was reduced to sixteen hours for the entire duration of seedling growth. The temperature was maintained at 22°C to 20°C for light and dark periods of the growth cycle. Seedlings were kept on higher E.C for three weeks. The E.C was then reduced to 2.5 to 3 and was maintained for the next three to four weeks or until the plants were transferred to the double poly greenhouse. The coco blocks of plants were transferred on to the top of the bags (FORTECO Basic Cocobag NL- Dry matter: 80%, Organic matter 75%, pH (H₂O): 5,0-6,5, Ec 350µS/cm, Water retention capacity 850 g H₂O/100g dry matter, weight 1,4 kg 8 x vol).

Gre Neth NL coconut husks substrate- Dry matter: $\pm 80\%$, Organic matter: $\pm 95\%$, pH (H₂O): 5,0-6,5, Ec <1000 $\mu\text{S}/\text{cm}$, weight 2,7 kg), and hooked to drip irrigation system injector ratio feeding system was used in experiment. Commercial greenhouse grade water soluble fertilizers were used. Fertilizers were calcium nitrate, potassium nitrate, mono potassium phosphate, potassium sulfate and magnesium sulfate. The micro nutrient were chelates of copper, iron, manganese and zinc. Boron was from borax deca-hydrate and molybdenum from sodium molybdate. Standard management and cultural practices were carried out for all the crops. After each crop removal the greenhouse was thoroughly cleaned for crop residue, the previous crop plant blocks were taken out along with some root mass to accommodate the new blocks. Yellow sticky glue traps were used to monitor the insect population. During the period of all three crops very minimal insect population were observed, consequently the crops were never sprayed with any pesticides.

Results and Discussions

Results obtained in experiment were analyzed using bifactorial analysis of variance (2x2) for each year separately. Main factors were cultivars (H) and growing type (GT).

Table 1. Average values of the studied properties tomato in cocopeat

Variable		Average fruit number per plant				Average fruit mass (g)				Average yield (kg/plant)			
Hybrid		Bella ez F ₁		Sinatra F ₁		Bella ez F ₁		Sinatra F ₁		Bella ez F ₁		Sinatra F ₁	
Growing type		B	P	B	P	B	P	B	P	B	P	B	P
Year	2004	68	70	63	65	188,00	192,00	179,00	184,00	12,78	13,44	11,27	11,96
	2005	67	72	66	68	186,00	189,00	184,00	187,00	12,46	13,60	12,14	12,71
x		67,5	71	64,5	66,5	187,00	190,00	181,00	185,00	12,62	13,52	11,70	12,33

* B – bag

** P – pot

Table 2. Significant levels and probabilities of main factors and their interactions

Factors	2004	2005
	<i>p-level</i>	<i>p-level</i>
Hybrid	***	**
Growing type	***	***
H x GT Interactions	ns	*

Analysis of variance showed statistically significant differences for both years between treatments or levels between main factors ($P < 0,001$). In year 2005.

there was statistically significant interaction between main factors ($P < 0,05$), which can be explained by higher number of light period hours in time of pollination.

Fruit yield and harvest date results indicate that both media were comparable. Cultivar Belle had the total yield of marketable fruits on the coco bag 12.62 kg/plant, on the pot 13.52 kg/plants and higher then cultivar Sinatra.

In yields, difference were non-significant when compared at 5% level of significance. Studies conducted by Shinohara et. al; (1997) reported similar results with tomato yields, when coconut fiber substrate was compared to bark or rice husk. They also concluded that excess supply of nutrient solution is essential when coco nut fiber substrate was used for the first time.

Blom, J.T. (1999) concluded with roses that during the first year coco coir produced about 15.6% more marketable stems as well as 18% more fresh weight compared to granulated rockwool, while there were no significant differences between the substrates during the second year. There were higher levels of micro-elements in rose stems grown in coco coir than those grown in rockwool.

In our study the coir pot was decomposing at a slower rate than the coco bag, it may be able to sustain longer and multiple crop cycles. Perhaps a three year crop cycle may be enough to justify the initial cost of media and a heavier poly bag may be the answer to the poor bag performance. Alternatively a trough culture should be considered, instead of using poly bags.

At the end of each crop, four weeks of resting period was found to be sufficient enough to allow adequate decomposition of previous crop's root system and adequate drying of the bags. The root decomposition was quicker in coco coir in the bag as compared to coco pot.

Conclusion

The success of tomato production in coco is mainly based on the behavior of the plants growing in it. Better media results in higher yields and improved crop quality. Coconut husk has shorter fibers, adjusted to give a successful growing medium.

As an alternative to peat or rock wool, it offers a high moisture and air retention capacity, which enables easy growth and well spread root system

It appears from this study that coco coir is a suitable growing medium for the production of tomatoes under greenhouse conditions.

References

- Borošić J., Novak, B., Benko B. (2003) Uzgoj rajčice na inertnim supstratima. 38. Znanstveni skup hrvatskih agronoma. Opatija, Proceedings, 219-220 pp.
- Parađiković N. (2002) Osnove proizvodnje povrća. Katava d.o.o.
- Straver N., Sonneveld, C. (1988) Nutrient solutions for vegetables and flowers grown in water or substrates. Proefstation voor Tuinbouw onder Glas, Naaldwijk (Netherlands)
- Krcij C., Sonneveld, C., Warmenhoven, M.G., Strower, N.A. (1992) Guide values for nutrient element contents of vegetables and flowers under glass. PBG brochure No. 15

- Shiniohara Y., et all. (1997): Chemical and Physical Properties of the Coconut – fiber substrate and the growth and productivity of tomato (*Lycopersicon esculentum* Mill.) plants. Proc. Int'e Symposium of Growing Media and Hydroponics Ed.A.P Papadopoulos. Acta Hort. 481 ISHS, 145-149.
- Blom T.J. (1997); Cococoir versus granulated rockwool and versus traditional harvesting of rose sin a recirculating system. Alberta Hort. Congress, Nov., 1997. Edmonton, Alberta.
- Teo and Tan (1993): Tomato production in cocopeat, Planter 69.
- Savithri P. and H.H. Khan (1993): Characteristics of coconut coir peat and its utilization in agriculture. Journal of plant crop. 22, 1-18

GAJENJE PARADAJZA NA SUPSTRATU OD KOKOSOVE LJUSKE

- originalni naučni rad -

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Rezime

Uspeh hortikulturnih proizvoda se uglavnom zasniva na ponašanju biljaka gajenih na različitim hranljivim podlogama. Bolje hranljive podloge uslovljavaju veće prinose i bolji kvalitet useva. Kokosova ljuska ima kraća vlakna i kompostira se radi dobijanja kvalitetne hranljive podloge. Kao zamena za treset ili kamenu vunu, obezbeđuje visoku vlažnost sposobnosti zadržavanja vazduha, obezbeđujući brži porast i dobru razvijenost korenovog sistema. pH se kreće od 5,2 to 6,8. Sabijena hranljiva podloga se širi osam do devet puta.

Ispitivanja su izvršena na sortama paradajza Bella i Sinatra. Razmak sadnje iznosio je 3 biljke po m². U svakoj vreći bilo je po tri biljke, a zapremina hranljive podloge iznosila je 12,5 l i po jedna biljka se nalazila u svakoj saksiji (zapremina podloge 2 l). Kokosovi blokovi biljaka paradajza prebačeni su na vrh vreća i prikačeni za sistem navodnjavanja kap po kap opremljen sistemom ishrane pod pritiskom. Prinos plodova i rezultati berbe ukazuju na uporedivost obe podloge. Ukupan prinos prodajnih plodova sorte Belle u vrećama sa kokosom iznosio je 12,62 kg/biljci, a u saksijama 13,52 kg/biljci i bio je veći nego kod sorte Sinatra.

Može se zaključiti da je kokosovo vlakno pogodna hranljiva podloga za proizvodnju paradajza u zaštićenom prostoru.