

STUDIES ON TIMING OF SOWING DATES ON QUALITY CHARACTERISTICS OF HUSK TOMATO (*Physalis pubescens*, L.)

Kabil, N. T. and M. H. Asfour

Vegetable Research Department, Horticulture Research Institute, ARC.

ABSTRACT

Two field experiments were carried out at Kaha vegetable experimental farm Kalubia Governorate During 1998 / 1999 and 1999 / 2000 seasons as autumn, early winter, early summer and summer to produce high quality and quantity of Husk tomato yield and seeds.

Obtained results indicated that the height and strong plants with best yield resulted at early winter season, while in autumn season obtained highest yield of seeds. On the other hand sowing at summer season obtained the earliest one.

INTRODUCTION

Husk tomato (*Physalis pubescens*, ixocarpa L) is consider one of most important non-traditional vegetable crops, not only for it high nutritive value but also to provide a high chemical components of the diet. Husk tomato plants cultivate in small average in Egypt.

During the last few years, which, it is very important for the foreign markets especially the European ones, during late fall and early spring. Due to the rarely knowledge are research about sowing date in Egypt, pests and disease attack these plants, so it was suggested to carry on this study in an attempt to find out the appropriate date of planting. Also to study the effect of sowing dates on total yield, seed on one side and its components on the other. This was through to help in finding out some way to difficulties facing husk tomato production during all seasons, which was the aim of this study.

On a study the effect of preharvest removal of 1, 3, 5 immature fruits on subsequent fruit development and yields in 4 cultivars of husk tomato were determined. Preharvest fruit removal had no effect on yields or fruit size, but removal of 1 or 3 fruits accelerated ripening in the remaining fruits. The effect were similar regardless of the maturity stage of the fruits removed. Continuous harvesting resulted in higher yields than single harvest (Saray and Miranda, 1986).

Farag *et al.* (1991) found that early planting at winter stimulated plant growth. On the effects of density on the yield components of cherry tomato Moccia and Katcherian (1997) found that yield per unit area increased linearly with planting density, while yield per plant decreased. Increasing plant density increased the number of trusses, flowers and fruits harvested, but decreased the average fruit weight.

The largest gain, on the basis of mean number and weight of fruit per plant 70 days after transplanting (earliness), was obtained from SMIV1 at a plant density of 33000 plant/ha. A mean fruit number / plant of 33.62 and a mean fruit weight / plant of 1.157kg were obtained from another selection, also

the average number and weight of fruits / plant 70 days after transplanting, was obtained when plant density was 33000 plants/ ha. A mean fruit number /plant of 33.62 and a mean fruit weight / plant of 1.157kg were obtained from another selection, also the average number and weight of fruits/plant 70 days after transplanting, was obtained when plant density was 33000 plants/ ha. and gave 1.167kg. and 33 fruits per plant. (Perez *et al.*, 1994).

Planting at early winter was the best time to increase and improved the yield characters of (Thacheva, 1986; Lipari and Paratore, 1986; EL-Sherbini *et al.*, 1987; Hassain *et al.*, 1988 and Hussien *et al.*, 1990). Studies showed that fruits increased in length as it progressed towards (Abo-EL-Hamd, 1981).

In India that tomatillo or husk tomato plants (*Physalis ixocarpa*, B.) yielded 3 to 4 pickings each averaging from 50-60 fruits per plant (Bharagava *et al.*, 1963). Advances in our understanding about the relation between seed formation and both weight and size of fruits was caught up from some reviews. Studies on the fruits of *Physalis alkekengi* L. suggested that the developing seeds were the auxin sources. In other words, the fertilized ovules and developing seeds are the centres of Auxins production necessary for fruit growth (Ratikin and Britikov, 1973).

Total and marketable yields were highest at the closed spacing (41.8 and 38.1 t/ha) plants at the closet spacing produced the largest number of small and medium-sized fruits, the number of large fruits was similar at all spacing.

Total and marketable yield were highest in a 1 m between-row planting distance. Plants in row 1-25m apart produced the greatest number of large fruits (Garzon and Garay, 1986).

Fruit maturity did not coincide with seed maturity in *P. ixocarpa*. The highest percentage germination (60-65%) was obtained in seeds extracted from hole fruits which had been harvested at maturity (Orduna *et al.*, 1992). EL-Sherbini *et al.* (1987) found that sown in January of some tomato cultivars gave a seed yield greater than which sown in February.

The highest seed index and germination Rate obtained by (Hussein *et al.*, 1990) seed sowing on April, on the other side Farag *et al.* (1991) show that seed Germination was not affected by planting date. On the effect of the planting date on the number of seeds per fruit. (Vadivei and Arumugan, 1994) indicated that the most effective sowing date to increase number of seeds /fed and quality of seeds.

Some important reviews had been published concerning the acids content in *Physalis spp.* Thus it was found that the fruits of *Physalis peruviana* contained 0.56% organic acid, while the total acidity reached 0.90% in another work (Mazumdar and Basu, 1979). Total soluble solids had long been presumed strongly in the changes of taste during fruit growth in deed T.S.S. is one of the easily and frequently measured characters. Thus on tomato, there was evidence in the literature that these chemicals increased with the advance in age (Radwan *et al.*, 1979).

Dry matter content increase from plants sown after 1 mg (Sucun *et al.*, 1981). Total reducing sugar content ranged from 1523.3 mg/100g fresh weight to 2493.3 mg/100g F.W. (Sigala *et al.*, 1994). The mid of September is

sowing gave significantly greater total sugar than those of the other sowing dates (Abel.Fahmey and EL-Guany, 1969).

MATERIALS and METHODS

The local variety (Balady) of husk tomato (*Physalis pubescens*, L.) was used in this investigation. The plants were grown in Kaha vegetable experimental farm Kalubia Governorate. Two successive seasons of 1998 / 1999 and 1999 / 2000, to study the effect of dates of sowing on yield, seed production and its quality. Four selected seasons dates of seed bed sowing as autumn, early winter, early summer and summer at 1st of August, 8th September, 1st January and 28th February respectively, then transplanted in 7th October, 2 8th November, 9th March and 4th June respectively in open field but *Physalis ixocarpa* sowing only at summer season only at 1st January then transplanted in 22nd January.

The design of the experiments was complete randomized block with three replicates, the size of each replicate was 30 m² and consisted of 5 rows. Each row was 6 meter long and one meter wide. Seedlings were transplanted 60 cm apart on the row. Other agricultural practices took place whenever it was necessary according to the recommendations of Stino *et al* (1963). Data were statistically analyzed according to Snedecor and Cochran (1972).

All the following determinations were carried out as follows:

A. Vegetative growth:

- 1-Plant height (cm) was estimated by vernier caliper at the end plant stage.
- 2-Number of branches at the end of plant stage was calculated.

B. Flowering characteristics: which included

- 1 -Earliness (in days) the average number of days from sowing to 1st fruit set flower opening was recorded.
- 2-Fruit set (in days) the average number of days from sowing 1st fruit set to set of flower was recorded.

C. Fruit yield as follows:

- 1 -Weight of yield/plant (gm)
- 2- Number of fruits/plants (No.)
- 3- Total yield/fed, (ton)

D. Seed yield as follows:

- 1-Weight of seed/plant (gm.)
- 2-Number of seed/fruit (No.)
- 3-Yield of seeds/fed (Kg.)
- 4-Seed germination percentage (%)
- 5-Rate of seed germination (in days).
- 6-Seed index (weight of 1000 seeds).

E. Chemical properties: which are:

- 1- Ascarbic acid (mg/100 g F.w.).
- 2- Fibers(g/100gD.W).
- 3- Chlorophyll -a (mg/100 g F.W)
- 4- Chlorophyll - b (mg/ 100 g F.W)
- 5- Total caroteniode (mg/ 100g F.W) were estimated clourineterically according to the method described in the A. O. A. C. (1965).
- 6- Total soluble solids percentage in fruits was estimated by Ziess hand refractometer (A. O. A. C., 1965).
- 7- Titrably acidity (g/100 g F.W) according to the method of(A. O.A.C., 1965).
- 8- Total sugars (g/mg F.W).
- 9- Reducing sugars (g/mg F.W).
- 10- Non reducing sugars (g/ mg F.W) were estimated according to Morell (1941).
- 11- Dry matter % of the above average % fruit parts were determined by drying at 70 °C till constant weight was reached.

RESULTS AND DISCUSSION

A. Vegetative growth i.e. (plant height and N. of branches)

Observations from Table (1) indicate obviously that there was increasing on plant height especially at early winter of the first season. More over obtained increments are statistically significant at 1st growing season.

Table (1): Effect of planting dates on vegetative growth and flowering characteristics of Husk tomato var. *Physalis pubesciens* (Date)

Planting dates	First season			
	Earliness (days)	Fruit set (days)	Plant height (cm)	No .of branches (No.)
Autumn	46.8	53	73.9	25.9
Early winter	52.7	59	102.2	14.2
Early summer	48.7	59.3	101.7	17.8
Summer	38.7	46	87.8	18.3
L.S.D.	5.7	5.3	9.9	3.8
<i>Physalis ixocarpa</i>	37	44	40	8

***Physalis pubesciens* (Date)**

Autumn	46.6	52.7	93.3	14.3
Early winter	54.7	61.7	103	15
Early summer	47.7	59	104.7	18
Summer	39.7	47	91	17.7
L.S.D.	4.6	2.6	N.S	2.4
<i>Physalis ixocarpa</i>	39	43	41	9

Table (1) show that there was significant effect due to the sowing date in branching in both experiments. From the horticultural point of view in autumn planting and in early summer are gave the highest number of branches per plant respectively.

These results were in agreement with Farag *et al.* (1991) who found that early planting at winter stimulated plant growth.

B. Flowering characteristics i.e. (earliness and fruit set).

Data presented in Table (2) show that there was significant effect on the number of days from sowing to the opening of the first is flower and fruit set in the two season, the planting date on summer seasons was the earliest one. These results has been mentioned by Takahashi and Takai (1984).

Table (2): Effect of planting dates on fruit yield of Husk tomato var. *Physalis pubescens* (Date)

Planting dates	First season		
	Total yield/ plant (gm)	Number of fruits / plant	Total yield / fed (Ton)
Autumn	725.2	287.1	5.8
Early winter	828.9	407.6	6.6
Early summer	359.0	185.2	2.9
Summer	226.1	119.4	1.8
L.S.D.	163.7	105.9	1.3
<i>Physalis ixocarpa</i>	484	103	7.21

***Physalis pubescens* (Date)**

Autumn	273.8	155.3	2.2
Early winter	793.3	261	6.3
Early summer	362.2	177.4	2.9
Summer	245.6	133.7	2.0
L.S.D.	195.3	74.7	1.5
<i>Physalis ixocarpa</i>	502	110	7.89

C. Fruit yield as follow i.e. (weight of yield/plant, number of fruits/ plant and total yield / fed.)

Data presenting expressed as total yield per plant as well as total yield feddan and the number of fruits per plant of husk tomato clearly demonstrated the effect of planting sowing in both growing season. Data revealed that all treatments were significant effect in this character in both growing seasons.

In other words, the planting date in early seasons was the best one. The same conclusions was obtained by Tkacheva (1986), Lipari and Paratore (1986), El-Sherbine *et al.* (1987), Hassain *et al.* (1988), Hussien *et al.* (1990) and Moccia and Kotcherion (1997) who reported that planting at early winter

season was the best time to increase and improved the characters of yield comparing with any other sowing date throughout the year.

D. Seed yield as follows i.e. (weight of seeds/plant, weight of seed/fed, No. of seeds/fruit, seed index, germination percentage and rate of seed germination).

The effect of planting date on weight of seeds/plant and per feddan are shown in Table (3). It is obvious that there was significant among the various treatments especially in the autumn.

These results are in line with those reported by Husseien *et al.* (1990) indicated that the highest seed index and germination rate when obtained by seed sowing on April, the while Farag *et al.* (1991) show that seed germination was not affected by planting date.

Table (3): Effect of planting dates on seed yield and its components of Husk tomato var. *Physalis pubesciens* (Date)

Planting dates	First season					
	Total seed yield/plant (gm)	Total seed yield / fed (Kg)	No. of seed fruit (No.)	Seed germination %	Rate of seed germination (days)	Seed Index
Autumn	21.9	175.3	152.6	71	5.2	0.91
Early winter	13.1	104.5	141.5	73.1	4.4	0.96
Early summer	9.1	75.5	164	70.2	4.8	0.92
Summer	6.9	55.2	134	71.9	4.0	1.05
L.S.D.	1.8	16.9	16.6	N.S	6	0.21
<i>Physalis ixocarpa</i>	5.8	87	170	81.1	4.3	1.1
<i>Physalis pubesciens</i> (Date)						
Autumn	12.9	103.2	146.7	73	5.6	0.93
Early winter	13.1	104.5	187.3	75	4.6	0.98
Early summer	8.1	64.8	163	74	5.0	0.94
Summer	9.5	76.3	131	76	4.3	1.07
L.S.D.	N.S	N.S	14.5	N.S	N.S	N.S
<i>Physalis ixocarpa</i>	6.1	91	173	82.1	4.4	1.2

The effect of the planting date on the number of seeds per fruit are shown in Table (3). It is evident from the data that there was significant difference between the various treatments in both season. The planting sowing in winter was the most effective treatment, these results are in harmony with those reported by Farag *et al.* (1991) and Hussien *et al.* (1990) and Vadivei and Arumugan (1994) the results indicated that the most effective sowing date to increase number of seeds/ fed and quality of seeds.

Data illustrated in Table (3) indicate clearly that there was significant between the treatment in rate of seed germination and seed index clearly clear at summer season, the data obtained from seed germination indicated that there was no significant differences among the various times. However, the obtained results coincided with those obtained by EL-Sherbini *et al.* (1987) found that sown in January the cultivars pritchard, Ace and pearl Harboual gave a seed yield 109.6, 152.8, 28.28.6 and 21.9% greater respectively than fibrary sown plants.

E. Chemical properties i.e. (ascorbic acid, Fibers, chlorophyll a"b, total carbohydrate, total soluble solids, acidity, total sugars, reducing sugar, non reducing sugar and dry matter percentage),

Data presented in Table (4) show the chemical composition of fruit, i.e. Fibers, total soluble solid, reducing sugar and dry matter percentage were affected with planting sowing. From such data it is recognized that there was a significant increment, the highest level was in autumn season, while the obtained figures of total sugars did not clear any significant, similar results were obtained by Abel.Fahmey and EL-Guany (1969) found that the mid of September is sowing gave significantly greater total sugar than those of the other sowing dates, Suciú (1981) showed that dry matter content increase from plants sown after 1st May.

The results clear in Table (4) that planting date induce significant effect on ascorbic acid, chlorophyll A- chlorophyll B, total carotenoids and non reducing sugars the winter season was the most effective treatment. These results are in harmony with those reported by Shinohara *et al.* (1983) showed that fruits from the winter crop, the ascorbic acid content was half from that of fruits from the summer crop. In early summer season it was clear that all the treatment significant effect than any time of sowing date.

It can be concluded as a general from data of planting date studied, that winter season was the best one for strong plant height with high quality yield of hostale fruits, on the other hand the autumn date is the suitable to high quality and quantity of Hask tomato seeds, while planting at summer season is the best for getting the earliest flowers and fruit set.

Table (4) : Effect of planting dates on vegetative growth and flowering characteristics of Husk tomato var.

Planting dates	V.C. Mg/100g F.W	Fib.g/100g V.W	Chlorophyll a Mg/100g F.W	Chlorophyll b Mg/100g F.W	Total carotene Mg/100g F.W
Autumn	13.2	0.18	0.57	0.50	3.38
Early winter	13.3	0.28	0.50	0.40	4.9
Early summer	8.3	0.25	0.50	0.43	3.6
Summer	6.8	0.23	0.47	0.40	3.9
L.S.D.	2.5	0.05	N.S	0.05	0.89
<i>Physalis ixocarpa</i>	21.2	0.21	0.17	0.30	2.2

Cont. Table (4)

Planting dates	Titrability Acidity g/100g F.W	T.S.S	Total sugars Mg/100g F.W	Reducing sugars g/100g F.W	Non Reducing Sugars g/100g F.W	Dry matter % (F.W)
Autumn	1.83	12.8	5.1	2.79	2.31	17.8
Early winter	0.97	11.6	4.5	1.8	2.7	16.8
Early summer	0.83	10.6	3.9	1.6	2.3	17.8
Summer	0.87	10.5	3.8	1.5	2.3	15.9
L.S.D.	0.08	1.77	N.S	0.77	N.S	0.96
<i>Physalis ixocarpa</i>	0.34	8.2	3.46	3.84	2.7	18.2

REFERENCES

- Abel.Fahmey, E. and El BO Guauy. (1969). Effect of sowing date on some characters of carrot varieties (*Vaucuscarota* var. *sative*, UC.), M. Sc. Thesis. Faculty of Agric. Alexandria.
- Abo-El-Hamd, A.S.A.A. (1981): Physiological studies on the developmental stages, handling and storage of tomato. Ph.D. Thesis, Faculty of Agriculture, Al-Azhar University.
- Association of official Agricultural Chemists (1970): Official Methods of analysis. A.O.A.C.8thed.Published by A. O. A.C. Washington.
- Bhargava P.D.; S. C. Mathur and A.G. Khan (1963): Tomatillo serves many a purpose. *Indian Hort.*, 7 (4). (*Hort. Abstr.*, 34: 5072, 1964).
- El-Sherbini, S. M., S. A. Mohamedien, A.M. Hammouda and S. M.Omar (1987): Influence of changes in weather conditions on fruit and seed yield of tomato. *Agric. Res. Rev.* (1982) 60 (3) 125-142 [En, ar, 15 ref] *Hort. Res. Inst. Egypt.* [C. F. Hort. Abst. 57. No. 8: 675].
- Farag, S. S. A.; S. H. A. Omer and Anisa , I. Ismail (1991): Effect of planting date and seed granding on growth, flowering, seed productivity and quality of prood bean CV.
- Garzon -Tiznado- JA, Garay Avarez - R (1986): Influence of planting density on yield and fruit quality of husk tomato (*Physalis inxpcarpa* Brot.) cultivar Rendidoma American - Society from Horticultural – Science, 23: 268-270 (1986).
- Hassain, M. M.; Karim, M. A; Ho Quo, M. M.; and Hossain, A. K. M. A. (1988): performance of some tomato lines planted at different dates. *Bangladesh Hart.* 14(1): 25-28 (En, 3 reg. J. Reg. Agric. Res. Sta., Jamalpur, Bangladesh, (C.F. Hort. Abst., 58 No. 11: 7740).
- Hussien, Abel-Gaber, M. El. Seifi, S. K. and Anisa, I.I. (1990): Effect of seed sowing date and spacing on seed yield and quality of suoash under nubaria conditions. *Egypt. J. Appl. Sci*, 5(8). 687-696.
- Hussien, A. M. and Anisa I. Ismail (1991): Effect of sowing date and plant Density on seed yield and quality of climbing bean growth under plastic houses. *J. Agri. Sci. Mansoura Univ.* 16(12): 2963-2969.
- Lipari, V.; paratore, A. (1986): effect of sowing date and transplanting age on timing of production and yield of some Solanaceae. *Acta Hort.* No. 176, 143-149 [En, 5 ref.] University di catania, Italy (C.F. Hort. Abst. 56 No. 9: 7014).
- Mazumdar, B.C. and T.K. Basu (1979): Analysis for cape goose berry fruits. *Plant science*, 11: 110 (*Hort. Abstr.*, 52: 2852, 1982).
- Moccia, S. and F. Katcherian (1997). Effect of density on the yield components of cherry tomato. *Hort. Argentia*, 16: 40-41 (1997).
- Morell, S. A. (1941): Rapid determination of reducing sugars indust. *Eng. Chem. Anal. Ed.*, 13: 249-51.
- Orduna- Mercado, OE; Pena- Lomeli, A, Cruz- Garza, R4. (1992): Germination of husktomato (*Physalis ixocarpa* Brot.) *Revista-chapingo*, Mexico. 16: 78, 74-77 (1992).

- Perez-Grajales-M, Sahagun-Cahagun- Castellonos- J; Pena - Lomeli- A; Marquez- Sanchez-F, Campobell - RJ. (1994): Genetic improvement of husk tomato (*Physalis ixocarpa* Brot.) selection and evaluation for concentration and earliness of harvest Oricedubgs - of - the - Interamerican. Society - for tropical - Horticulture. 38: 226-231 (1994).
- Radwan, A.A., A.A. Hassan, and N.M. Malash (1979): Physiological studies on tomato fruits firmness, total soluble solids and vitamin C contents. Research Bulletin No. 1063 Faculty of Agric. Ain shams University. (Hort. Abstr., 50: 9141, 1980).
- Ratikin, Y.V.; E.A. Britikov (1973): Developing seeds as auxin sources. Fiziologiya Rastenii, 20 (6) (Hort. Abstr. 44: 7450, 1973).
- Saray - Meza- Cr, Miuand - colin-s (1986): Effect of preharvest fruit removal (warming) on yield and precocity of husk tomato (*Physalis ixocarpa* Brot). Agricultura - Tecnica - en - Mexico, 12:2, 159-171. (1986).
- Shinohara, y; Suzuki, y. and shibuya, M. (1983): Effects of cultivation method, growing season and cultivar on the ascorbic acid content of tomato fruits. J. of the Jap. Soci. For hort. Sci. 51(3) 338343 (Ja, en, 21 ref.) Tsukuba Univ., Sakura, Niharai, Lbaraki 305, Japan (C. F. Hort. Abst. 53 No. 6: 4265).
- Sigala- M, T. Ramirz - B. CE, Pena - Lomeli - A (1994): Determination of simpler sugars and acidity in accessions of husk tomato (*Physalis ixocarpa* Brot.). Revista - chapingo - serie - Horticultura 1: 2, 141-143.
- Snedecor, G.W. and W. G. Cochran (1972): Statistical methods Iowa state Univ. Press. Iowa, U.S.A.
- Stino, K. R., E. Farrag, M. A. Maksoud; W. A. Waned; A. A. Radwan and A. O. Gavar, (1963): Vegetable crops. 2nd Ed. Anglo Egyptian Book Shop Cairo, Egypt.
- Suciu, Z.; Fanu, M.; Trorean, I.; Malmagean. (1981): Studies on the behaviour of some tomato hybrids grown in green houses. First cycle. Studi privind comporarea unor hihrizi de tomato, cultivati in sera, ciclul Lucrari Simnlfce, Inst. Agron. Timisoara. Agron. 16, 217221 (Ro, en, 4 ref.) institutui Agronomic, Timisoara, Romania (C. F. 51 No. 11: 8628).
- Takahashi, H. and Takai. T. (1984): Studies on tomatoes cropped in summer to autumn in the northern part of 5 Japan. I. Influence of seeding date and training method on harvesting peak and yield. Bulletin of the Akita prefectural college of Agric. No. 9, 119-127 (Ja. En, 15 ref.) Akita prefectural college of Agric, Ohgatamura, Akita pfecture, 101-01, Japan. (C. F. Hort. Abst. 54. No. 7: 4599).
- Tkacheva, N. P. (1986): Tomato Varieties suitable for summer sowing in the Krasmodar area. Nauchnotekhnicheskij Narodou Nauchnoissledovatel Skogo Instituta Rastenievadstva Imeni N. I. Vavilovo No. 137, 79-81 (Ru, en) opytno-seleksiionnaya stantsiya VIR, Krymsk USSR (C. F. Hart. Abst. 56. No. 9: 7012).
- Vadivei, E.; Arumugan, R. (1994): Studies on seed yield of tomato south Indian Hart. 41 (4) 235-236 (Eu) Hart. College and Res. Inst., periyaakulam 626-501, India (C.F. Hart. Abst. 64 No. 5: 3695).

دراسة على ميعاد زراعة ومواصفات الجودة فى الحرنكش
نبيل محمد طلعت قابيل - محمد حلمى عصفور
قسم بحوث الخضر - معهد بحوث البساتين

أجريت هذه الدراسة فى مزرعة قها محافظة القليوبية وذلك لدراسة تأثير ميعاد زراعة الحرنكش (نيلى / شتوى مبكر / صيفى مبكر / صيفى) على محصول وإنتاج البذور بجودة وكمية عالية عامى ١٩٩٨ ، ١٩٩٩ وقد أوضحت النتائج المتحصل عليها إن الزراعة فى العروة الشتوية المبكرة هى أنسب العروات لإنتاج نباتات قوية من الحرنكش ذات محصول ثمرى مرتفع وعالية الجودة إلا أن العروة النيلية قد تفوقت فى إنتاج المحصول البذرى من حيث الكمية والجودة.
أما الموسم الصيفى فقد كان مناسب لإنتاج نباتات مبكرة من ناحية الإزدهار وعقد الثمار .