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ChemTech

International Journal of ChemTech Research
CODEN (USA): IJCRGG ISSN: 0974-4290
Vol.8, No.9 pp 149-161, 2015

Piercing sucking pests, growth and yield of sweet pepper cultivars as affected by alternative covers under plastic tunnel conditions.

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Abstract: An experiment was conducted for two successive seasons in two plastic houses using one different plastic cover for each house, white shade net and UVI polyethylene 200 mμ thicknesses. The study investigated the influence of plastic cover type on pest status and plant productivity. The obtained data showed too low pest density for *Tetranychus urticae* Koch, *Myzeus persica* (Sulzer) and *Bemesia tabaci* Gennadius under white net compared to polyethylene sheet in 2011-2012 season. That was undetectable in 2012-2013 seasons for *T.urticae*, *M. persica* and *B. tabaci* except for the spread of mildew diseases, and such pests were more prevalent in polyethylene cover house. Concerning sweet pepper productivity, it was significantly enhanced under net house in terms of early fruit yield, growth character such as leaf area, net assimilation rate and total fruit yield which conformed to other investigations worldwide.
Key words: white shade net, UVI polyethylene sheet, piercing sucking pests, sweet pepper productivity.

Introduction

Pepper is an important agricultural crop, not only because of its economic importance, but also for the nutritional values of its fruits, mainly due to the fact that they are an excellent source of natural colors and antioxidant compounds [1]. In this respect, Pepper fruit is considered an excellent source of bioactive nutrients, such as carotenoids, vitamin C and phenolic compounds[2]. It is generally assumed that environmental factors and agricultural techniques have an effect on the quality of vegetables and fruits [3, 4, 5.]

Hundreds of varieties of peppers are now available for the greenhouses. They range widely in size, shape, color, flavor, disease resistance and season of maturity. However, many previous workers indicated that varieties of pepper plants play a great role for improving the growth and productivity [6-10]

Shade-netting is an emerging approach in protected cultivation. Utilizing white nets and polyethylene sheet affects the environmental factors under greenhouse conditions, such as temperature and relative humidity. These factors were higher with application of polyethylene sheet compared to white net. There was a specific relationship between temperature and relative humidity and population of aphids, spider mites, thrips and whitefly by using white nets and polyethylene sheet. Population of different pests was flourishing as well as increasing temperatures and decreasing relative humidity.[11] mentioned that white ceran nets repeatedly increased the productivity of leafy crops and bell peppers compared with each crop's standard cover (polyethylene sheet) [12]. In Egypt, [13] stated that vegetables under protected cultivation are attacked by numerous insects and mites caused serious damage and high yield loses. Some of the photoselective shade nets contain pigments known to attract whiteflies and thrips (i.e. white, yellow and blue). Therefore, crops grown under those nets could potentially be at a higher or lower risk for pest infestation. Covering greenhouses with films or screens containing UV absorbing additives is known to provide better protection against most pests, relative to standard cladding materials [14]. Bell pepper (*Capsicum annuum*) is commercially grown under white ceran shade nets of 30-40% shading for producing high-quality fruit, avoiding sunburns, and saving on irrigation water. Technology can be used by its own, in net and screen houses, or alternatively combined with other covering materials used in protected cultivation. However, [15,16] on tomato and [17] on aborigine found that the marketable yield (kg/ m^2) and the number of fruits per m^2 in polyethylene houses were higher by 13 % to 17 % than in glasshouses.

The nets house provides protection from hail, pests and birds and there is no need to remove it over wintertime. Our systems provide the grower with the tangible benefits, such as increasing yields and product quality of fruits and giving the best climate condition within and light coming in from the outside. Pepper plants (*Capsicum unuum*) are commercially grown under white shade nets house of 30-40 % shading for producing high quality fruit. The number of fruits and the total fruit yield under the nets house were higher by 115- 135% relative to black shade net. On the other hand, the average fruit size was not significantly affected in most cases. Also, the average leaf chlorophyll content, photosynthesis rate, fresh and dry weight did not reveal significant differences. In Spain, the 30% shade net was promoting higher pepper and tomato yields compared to the black shade net [18]. Nevertheless, the yield from plants grown under the 40% shade net was not higher than that of the plants under the 25 % shade net. In this regard, quality pepper yield was significantly higher in the plots covered by 25 % shade net [19,20]. However, [21] reported that white ceran of 35% had the highest significant tomato plant growth, flowering, fruit characters and content of vitamin C. On the other hand, [22] reported that covering materials had no significant effect on plant length, leaf area, photosynthesis rate, and respiration rate and leaf chlorophyll content. In the same respect, [12] reported that the net screens provide a new tool that can be implemented within protected cultivation practices for improving crop performance, pest control and overall profitability of agricultural crops

This study aims at investigating the effect of white insect-proof nets as a more fitting greenhouse cover, in comparison with the UVI polyethylene sheets on pest status as well as sweet pepper productivity. A former study in the same region [23] revealed an unprecedented, high pest infestation of sweet pepper particularly *T. urticae* under white net, unlike what was revealed in those many investigations worldwide. Therefore, I thought of performing this experiment using the available former cultivars of sweet pepper. Net cover aims to reduce the cost of covering material and suppression pest population and to allow the start of the pepper growing season earlier under greenhouses with the three cultivars of sweet pepper plants considering growth, early yield, and marketable yield.

Material and Methods

The experiment was conducted utilizing two cover types, UVI (ultra violet immune) polyethylene sheet and white net one at Experimental Station of National Research Centre at Nubaria region, North Egypt, in 2011/2012 and 2012/2013 seasons. The experimental site had a sandy soil texture with pH of 7.6, Ec of 0.19 and the organic matter was 0.21% with 14.00, 8.90 and 15.60 mg/100g soil of N, P and K respectively. A 4-week-old of three cultivars of sweet pepper seedlings (*Capsicum annuum* L.), i.e. Syros, Pasodoble and Kyrat F1 were obtained from a local commercial nursery. Healthy seedlings of uniform size were selected and transplanted on plastic and net houses on July 15. Full dose of P_2O_5 (90 kg/fed.) as single super phosphate (15%P_2O_5) and half dose of K_2O (60 kg/fed.) as potassium sulfate (50% K_2O) plus compost (5 ton/fed.) were added at soil preparation and the mixture were then incorporated into the top 15 cm of the ridge. The K dose was applied 45 days after transplanting. Chemical fertilizers including mineral N were added through the fertigation system. A drip irrigation system was designed for the experiment. Regular standard agricultural practices common in the area as recommended by Egyptian Ministry of Agriculture were followed. Each experimental plot area was 20 m^2 (four ridges each was 1m in width and 5m in length). It means that the experimental design was factorial as split plot, where the two covering materials (plastic or net) were arranged in the main plots, but the three pepper cultivars were distributed within the sub-plots with 3 replicates.

Sampling for insect and mite pests:

Ten leaves per cultivar, representing different height levels, were randomly collected on a weekly basis within their experimental subplots, . The utmost apical or bottom leaves on plants were excluded from sampling. All mite and insect pests were counted using stereomicroscopes. Sampling of flying insects (adult of white fly) was performed directly by visual assessment.

At the vegetative growth stage, random samples of five plants from each plot were taken 45 days after transplanting for the determination of the plant's length, in cm, and number of branches. Leaves per plant, leaf area plant (LA) and net assimilation rate (NAR) were determined on the leaves No.4 from the plant top using a digital leaf area meter that was calculated according to [24] as well as early yield per plant (first 4-pickings). At harvest time (60 days from transplanting), pepper fruits were picked on a weekly basis through the harvesting period for the estimation of yield parameters, i.e. number and weight of fruits per plant, total yield per m^2. As for fruit quality determination, a random sample of 20 fruits from each plot was taken and the average fruit weight, fruit length and diameter as well as flesh thickness were recorded. The obtained data of experiments were subjected to the statistically analysis of variance procedure and the means were compared using the LSD method at 5% level of significance according to [25]

Results and discussion

I-Pest status

In the first season (2011/2012), in autumn, the lowest incidental infestation with spider mites *T. urticae* as seen in Table 1 averaged 49.0, individuals / ten leaves on Khyrat cv, whereas the highest density was recorded on Syros cv. of 248.0 individuals / ten leaves and the intermediate infestation was noticed on passodoble cv. under plastic cover condition. Almost the same infestation trend was recorded under net cover but with a very low density or scarcity in autumn Table 1. During winter and spring time, infestation of passodoble cv. exceeded the other cultivars when peaking to an average of 1031 *T.urticae* individuals / ten leaves under plastic covers. Population density of T.urticae over the first year was conclusively very high under plastic cover, not to be compared to the scarce density under net in autumn, winter and spring which declined to (0.0-15, 17-109, and 70-144 individuals / ten leaves, respectively. The sweet pepper cultivar and the considered season are the main factors which influenced *T.urticae* population density Table 1.). However, as for the plastic covering in both winter and spring seasons, *T.urticae* reached its maximum density for the three cultivars khyrat, passoodoble and syros.

In relation to aphid infestation during the first season (2011/2012) as shown in Table 1 *Myzus persicae* was not recorded entirely in autumn and completely rare in spring. Also in winter passodoble cultivar was more susceptible under plastic (total mean of 198 individual in winter season compared to the weak infestation of both khyrat and syros cultivars (total mean 2-6 individuals/ season). On the other hand, infestation with the cotton white fly *B. tabaci* was obvious high during the three seasons starting in autumn with peak during winter followed by declining in spring. But also infestation under net cover was very low and did not exceed half that infestation under plastic. The highest population was recorded on khyrat cv. and the lowest on Syros cv. In the second season (autumn 2012- spring 2013), the spider mite *T.urticae,* aphid *M .persicae ,* and white fly *B.tabaci* numbers were too low to record any statistical differences between treatments Table 2. However, there is also noticeable spread of downy mildew infestation over the net and plastic houses in spite of chemical treatments using prvicure n and *Tricoderma* formulations. The incidence of the spider mite, *T. urticae*, aphid *M persicae* and white fly *B tabaci* under net was undetectable compared to that under UVI plastic Table 2. Similar results were recorded by [26] in India for sweet pepper infestation with mite *Polyphagotarsonemus latus, ,B. tabaci* and relatively, *M. persicae* and *Aphis gossypii* in net house. Also, [27] mentioned similar very low infestation with *T.urticae* on sweet pepper in both winter and spring.

In relation to regional climatic conditions recorded during the experiment by the central lab of agricultural climate, Figs 1 and 2. It could be seen that scarcity census of insect and mite pests in the second season are due to the relatively higher humidity (≥ 90% and the temperature ≥ 20 ºC in that period from January until May which induced infestation with sweet pepper mildew disease caused by *Peronospora tabacina* and Leveillula *taurica* on account of the other piercing sucking pests and particularly the two spotted spider mite *T. urticae* [28].

The use of screens to protect plants is the usual strategy in the Mediterranean area. Screen manufacturers offer a range of netting that vary in their UV-absorbing properties and mesh area (the aim is to prevent passage of small insects like thrips by reducing the open area). [29, 30] compared the photo effects of seven different screens. Sweet pepper trials were conducted at the Gilat Research Center, Israel, where the spectral properties of the nets and their influence on pest infestation and crop development were evaluated. UV transmittance varied among the materials studied, ranging from 40% to 70% of the incident radiation. BioNet white and P-Optinet, which absorbed and reflected the highest amount of UV radiation, performed the best protection against the main pepper pest (thrips, white flies and broad mites). Spectral measurements also showed that the photo synthetically active radiation differentially penetrated the nets, which together with the amount of UV absorbed by the screenings, resulted in a range of plant height and chlorophyll content. Also, [18] mentioned that pest infestation of sweet pepper and vegetables has universally been affected by shade net color. The white flies and thrips preferred landing on yellow and blue nets, respectively. Nevertheless, the numbers of pests trapped inside tunnels covered by these nets were similar or lower than that in black net. But, the red net did not differ from the black shade net, whereas the white and pearl shade net significantly lowered aphid infestation due to their reflectivity of sunlight, deterring pest landing. The abovementioned discussion revealed that the sweet pepper pest status severity in white net was lower than that under the anti UV polyethylene plastic sheet. However, [31] mentioned that aphid, thrips spider mite, broad mite and mealy bug were more prevailing inside net house than the outside. Such controversy regarding investigations could be attributed to the manufacturing of net, i.e. color, UVI percentage mesh/unit area simultaneous with sweet pepper cultivars and climatic conditions.

II-Plant growth characters:

1-Effect of cultivars:

Results in Table (3) indicated that cv. Syros was better in the plant length (cm) in both seasons than cv. Pasodoble and Khyrat. But the number of leaves and branches were better in the first season only. However, plants of cv. Kyrat were bigger in the number of leaves, branches and net assimilation rate (NAR) than in cv. Syros and Pasodoble plants in the second season. At the same time, cv. Pasodoble plants produced the highest leaf area /plant (LA) in both seasons and net assimilation rate (NAR) in the first season only compared to the two cultivars. Furthermore, the statistical analysis of the obtained data showed that the differences within the different cultivars treatments were not great enough to reach that significant level of 5%. Similar results were recorded by [32] on sweet pepper as they reported that cv. El Mader might be due to the higher vegetative growth, higher photosynthesis and metabolic activities. The observed differences in vegetative growth of cultivars are mainly due to the genotype of each cultivar. This result was in harmony with previous findings of [33, 34, and 21]

2- Effect of covering materials:

Application of white net screen house Table (3) was more significantly effective on the most growth characters of sweet pepper expressed as leaf area plant (cm^2) and net assimilation rate ($mg/cm^2/day$) in both seasons of studies and number of leaves and branches in the first season only compared to the plastic cover. However, the superiority of sweet pepper plant growth which obtained the white net screen house may be due to its effect in offering better microclimatic air temperature, relative humidity and light intensity [35]. In the same respect, [36] indicated that the greatest value of relative humidity was detected under polyethylene cover treatment followed by the white net cover and a 2-6% increase in humidity associated with the use of net. Also, population of aphids, spider mites, thrips and whitefly were significantly decreasing by using white nets compared to using plastic covers [37]. These results are in good accordance with those reported by [13,14,12,21]

3- Interaction between plant cultivars and cover materials:

The interaction between cultivars and covering materials Table (3) did not reflect any significant effect on all plant growth characters. These results held well in both seasons. Generally, results indicated that the highest vegetative growth characters of sweet pepper plants, i.e. number of branches, leaf area plant and net assimilation rate were obtained by plants of cv. Kyrat grown under white net cover in both two seasons.

III- Early and total fruits yield:

1-Effect of cultivars:

Data in Table (4) show that Khyrat cultivar gave the heaviest early fruits yield/ plant (g) and weight of fruits/plant (kg). However, Syros cultivar resulted in the heaviest number of fruits/plant and average fruit weight (g). In the same respect, Pasodoble cultivar gave the biggest total fruits yield (kg). These results were true in the two seasons. But the differences in most cases failed to reach the level of significance. Similar findings were obtained by [6, 38, and 10]

2- Effect of covering materials:

The results of early and total fruit yield and its components of sweet pepper plants are affected by covering materials. Table (4) shows that the highest significant early and total yield of fruits and its yield components, i.e. number of fruits/plant, weight of fruits/plant (kg) and average fruit weight (g), were found by growing sweet pepper plants under net covering materials compared to plastic cover. These results were true during the two experimental seasons. Increments of total sweet pepper fruit yield (kg/m^2) by using net cover were 8.77 % and 9.33% for the 1st and 2nd seasons respectively when compared to plastic cover. It could be concluded that the superiority of total yield of fruits and fruit quality with the net covering materials may be attributed to the vigorous plant growth as shown in Table (3). These results are confirmed by those reported by [13,14,12,21]

3- Interaction between plant cultivars and cover materials:

The interaction between sweet pepper cultivars and cover materials showed no statistical differences in early and total yield and its yield components as shown in Table (2). In addition, sweet pepper Khyrat cultivar, growing under net house, gave the highest early yield and biggest weight of fruits/plant (in kg) in both seasons. However, Syros cultivar with growing under net house had a vigorous number of fruits/plant, average fruit weight (g) and a total yield of fruits/m^2 (kg). These results followed the same trend of changes in both seasons.

Physical fruit characters:

1-Effect of cultivars:

Concerning the effect of cultivars on the physical characters of sweet pepper fruits, it is clear from Table (5) that Kyrat cultivar had the highest fruit length (cm) and dry matter % of fruits. Meanwhile, Syros cultivar had the vigorous fruit flesh thickness (mm) and TSS %. Differences within the three cultivars used here were not great enough to reach the level of significance in both seasons. These differences among cultivars might be attributed much to the genetically differences.

2- Effect of covering materials:

The results of physical characters of sweet pepper fruits as affected by covering materials (Table 5) show that the physical fruit characters expressed as fruit length, fruit diameter, flesh thickness (mm), TSS % and fruit dry matter % did not reflect any significant effect on all physical fruit characters. These results held well in both seasons.

3-Interaction between plant cultivars and cover materials:

Data in Table (5) reveal that the interaction between covering materials and cultivars did not have any significant effect on the physical fruit characters. These results may be due to the independent effect of two factors of interaction, i.e. covering materials and cult

Table I A, B, C . Total mean number ± standard error of *Tetranychus urticae, Myzus persicae* and *Bemesia tabaci* individuals per ten leaves observed on a weekly basis in the three sweet pepper cultivars in the 2011-2012 season under both cover type.

A-*Tetranychus urticae*

		Autumn*	**Winter**	**Spring**	**Total**	**Mean**	**Standard error**
cultivar	**Cover type**	**R1**	**R2**	**R3**			
Khayrat (K)	Plastic	49.00	77.00	320.00	446.00	148.66	86.04
	Net	0.00	17.00	79.00	96.00	32.00	24.00
Total		49.00	94.00	399.00	542.00	90.33	109.94
Passodoble (P)	Plastic	138.00	1031.00	493.00	1662.00	554.00	259.59
	Net	0.00	109.00	144.00	253.00	84.33	43.36
Total		138.00	1140.00	637.00	1915.00	319.16	289.26
Syros (S)	Plastic	248.00	450.00	255.00	953.00	317.66	66.19
	Net	15.00	38.00	70.00	123.00	41.00	15.94
Total	263.000	488.00		325.00	1076.00	179.33	67.09
Total of all	450.000	1722.00		1361.00	3533.00		

B_*Myzus persicae*

Cultivar	**F. Source**	**R1**	**R2**	**R3**	**Total**	**Mean**	**Standard error**
K	Plastic	0.000	28.000	0.000	28.0	9.33	9.33
	Net	0.000	2.000	2.000	4.000	1.333	0.66
Total		0.000	30.000	2.000	32.000	5.333	9.68
P	Plastic	0.000	198.000	2.000	200.000	66.667	65.67
	Net	0.000	2.000	3.000	5.000	1.667	0.88
Total		0.000	200.000	5.000	205.000	34.167	65.85
S	Plastic	0.000	6.000	0.000	6.000	2.000	2.00
8	Net	0.000	0.000	2.000	2.000	0.667	0.66
Total		0.000	6.000	2.000	8.000	1.333	

C- Bemesia tabaci

Cultivar	F. Source	R1	R2	R3	Total	Mean	Standard error
K	Plastic	305.000	1034.000	114.000			280.31
	Net	173.000	300.000	43.000	516.000	172.000	74.19
Total		478.000	1334.000	157.000	1969.000	328.167	351.28
P	Plastic	130.000	627.000	184.000	941.000	313.667	157.44
	Net	69.000	141.000	40.000	250.000	83.333	30.02
Total		199.000	768.000	224.000	1191.000	198.500	185.64
S	Plastic	156.000	338.000	218.000	712.000	237.333	53.42
	Net	76.000	43.000	21.000	140.000	46.667	15.98
Total		232.000	381.000	239.000	852.000	142.000	280.31
Total of all		909.000	2483.000	620.000	4012.000		

- Inspection started on September 15 and continued on a weekly basis for three months in every season

S = Syros.
P= Pasodoble.
K= Khyrat.

Table 2. Total mean number ± standard error of *T urticae, Myzus persicae and Bemesia tabaci* individuals/ per ten leaves observed on a weekly basis in the three sweet pepper cultivars in the 2012/2013 season under UVI plastic

	Pest		
	T. urticae	*M. persicae*	*B. tabaci*
autumn	0.77± 1.09	0.0	0.0
winter	1.11± 1.53	0.33±0.5	0.22±0.44
spring	1.88± 3.44	0.44±1.33	0.55±1.66

Table(3): Effect of cover materials on total yield of sweet pepper plants under plastic tunnel during 2011- 2012 and 2012- 2013 seasons.

Cultivars	Covers	2011/2012 season					/2012/2013 season				
		Early yield/ plant (g)	No. of fruits/plant	W. of fruits/plant (kg)	Average fruit weight (g)	Total yield m2 (kg)	Early yield/ plant (g)	No. of fruits/plant	W. of fruits/plant (kg)	Average fruit weight (g)	Total yield m2 (kg)
S	Plastic	175.880	13.361	2.033	85.951	5.721	172.573	13.030	1.693	82.41	5.390
	Net	236.062	13.842*	2.532	89.280*	6.400*	199.390	13.507*	2.200	85.94*	6.067*
Mean		205.970	13.600	2.281	87.611	6.061	185.982	13.268	1.947	84.18	5.728
P	Plastic	177.501	12.951	2.311	85.260	5.900	174.190	12.620	1.977	81.92	5.570
	Net	257.770	13.433	3.040	86.900	6.399	224.590	13.100	2.703	83.56	6.066
Mean		217.641	13.192	2.671	86.081	6.151	199.390	12.860	2.340	82.74	5.818
K	Plastic	177.073	13.181	2.200	74.981	5.870	169.737	12.843	1.867	71.32	5.533
	Net	278.611*	13.060	3.162*	65.890	6.231	271.607*	12.727	2.827*	62.56	5.900
Mean		227.842	13.122	2.681	70.441	6.051	220.672	12.785	2.347	66.94	5.717
Plastic		176.822	13.163	2.180	82.062	5.830	172.167	12.831	1.846	78.55	5.498
Net		257.481*	13.442*	2.911*	80.690	6.341*	231.862*	13.111*	2.577*	77.35	6.011*
LSD at 5%	cultivars	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Covering	13.801	0.181	0.200	NS	0.121	37.077	0.184	0.202	NS	0.117
	Inter.	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

S = Syros.
P= Pasodoble.
K= Khyrat.

Table (4): Effect of cover materials on growth characters of sweet pepper plants under plastic tunnel during 2011/2012 and 2012/2013 seasons.

Cultivars	Covers	2011/2012 season					2012/2013 season				
		Plant length (cm)	Number of Leaves	Number of Branches	LA/ plant (cm^2)	NER mg/cm^2 /day	Plant length (cm)	Number of Leaves	Number of Branches	LA/ plant (cm^2)	NER mg/cm^2 /day
S	Plastic	90.671	124.671	37.000	83.280	18.440	87.333*	106.000	30.000	76.307	16.440
	Net	75.670	130.401	36.671	89.201	20.131	72.333	108.400	29.667	82.673	18.463
Mean		83.171	127.530	36.830	86.240	19.291	79.83	107.20	29.83	79.49	17.45
P	Plastic	68.670	109.400	29.432	86.951	18.990	65.333	101.400	29.333	80.233	16.993
	Net	81.000	128.333	36.031	92.310	20.220	77.667	103.667	34.000	85.380	18.377
Mean		74.831	118.871	32.730	89.631	19.610	71.50	102.53	31.67	82.81	17.69
K	Plastic	69.001	119.670	28.632	78.250	17.941	65.667	109.667	30.667	70.847	16.943
	Net	72.333	126.471	37.301*	95.691*	20.650*	69.000	108.400	34.000*	88.860*	19.393*
Mean		70.671	123.070	32.970	86.972	19.300	67.33	109.03	32.33	79.85	18.17
Plastic		76.111	117.911	31.690	82.822	18.461	72.778	105.689	30.000	75.796	16.792
Net		76.330	128.400*	36.671*	92.401*	20.330*	73.000	106.822	32.556	85.638*	18.744*
LSD at 5%	Cultivars	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Covering	NS	6.920	2.571	3.711	0.801	NS	NS	NS	3.790	0.971
	Inter.	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

S = Syros.
P= Pasodoble.
K= Kyrat.

Table (5): Effect of cover materials on physical fruit characters of sweet pepper plants under plastic tunnel during 2 011/2012 and 2012/2013 seasons.

Cultivars	Covers	2011/2012 season					2012/2013 season				
		Fruit length (cm)	Fruit diameter (cm)	Fleshthekness (mm)	TSS %	Fruit dry matter %	Fruit length (cm)	Fruit diameter (cm)	Flesh thickness (mm)	TSS %	Fruit dry matter %
S	Plastic	7.17	6.47	5.10*	3.35	10.11	6.83	6.140	4.763*	3.020	9.780
	Net	7.47	6.14	4.81	3.81*	10.65	6.84	5.810	4.477	3.480*	10.313
Mean		7.32	6.31	4.95*	3.58	10.38	6.84	5.98	4.620*	3.250*	10.047
P	Plastic	7.86	6.55	4.85	3.28	10.51	7.53	6.217	4.513	2.947	10.180
	Net	7.70	6.78*	4.57	3.25	10.95	7.37	6.443*	4.240	2.920	10.617
Mean		7.78	6.66*	4.71	3.27	10.73	7.45	6.33*	4.377	2.933	10.398
K	Plastic	9.50*	5.83	4.81	3.30	11.09	8.83*	5.500	4.473	2.937	10.760
	Net	9.47	6.16	4.79	3.30	11.17*	8.80	5.823	4.460	2.970	10.837*
Mean		9.49*	5.99	4.80	3.30	11.13*	8.82*	5.66	4.467	2.953	10.798*
Plastic		8.18	6.29	4.92	3.31	10.57	7.733	5.952	4.583	2.968	10.240
Net		8.21	6.36	4.73	3.46	10.92	7.670	6.026	4.392	3.123	10.589
LSD at 5%	Cultivars	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Covering	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Inter.	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

S = Syros.
P= Pasodoble .
K= Kyrat .

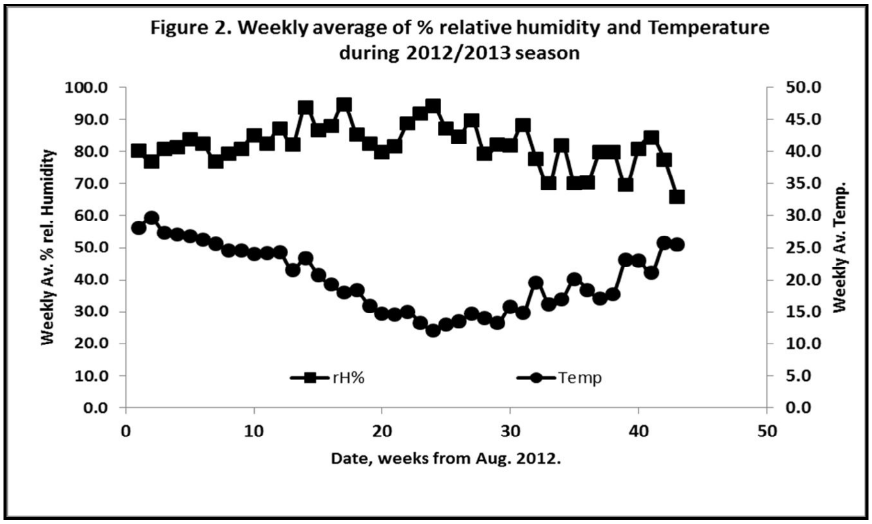

Figure 2. Weekly average of % relative humidity and Temperature during 2012/2013 season

Acknowledgements

The authors would like to thank Demetry, Z. N. NRC, and Plant Protection Department Personnels for her coordination and her financial support of this work.

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