Great Lakes Fruit, Vegetable & Farm Market EXPO
Michigan Greenhouse Growers EXPO

December 5-7, 2017

DeVos Place Convention Center, Grand Rapids, MI

Sweet Cherry

Where: Gallery Overlook (upper level) Room E & F
MI Recertification credits: 1 (1C, COMM CORE, PRIV CORE)
OH Recertification credits: 0.5 (presentations as marked)
CCA Credits: PM(1.0) CM(1.0)
Moderator: Emily Pochubay, MSU Extension

2:00 pm	Measures in SWD Management in the Alpine Region of Trentino (OH: 2B, 0.5 hr) • Nicola Dallabetta, Fondazione Edmund Mach, Italy
2:45 pm	Sweet Cherry Variety Susceptibility to SWD • Nikki Rothwell, NWMHRS Coordinator, MSU Extension, Traverse City, MI
3:15 pm	Opportunities and Potential for Growth in Fresh Market Sweet Cherries • Justin Finkler, Riveridge Produce Marketing, Sparta MI
3:30 pm	Outlook and Considerations for Growing Fresh Sweet Cherries in Michigan - Grower Panel • Adam Dietrich, Leo Dietrich and Sons LLC, Conklin MI • Justin Finkler, Riveridge Produce Marketing, Sparta MI • John King, King Orchards, Central Lake, MI • Isaiah Wunsch, Isaiah Wunsch Farm, Traverse City, MI
4:00 pm	Session Ends

Measures in SWD management in the Alpine region of Trentino

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Sweet Cherry Production in Italy

Cherry crop is undergoing a big change in recent years in Italy, as in other parts of the world. Low density planting (LDP) systems are being replaced by high density planting (HDP) systems using dwarfing and precocious rootstocks, along with new cultivars (Sansavini and Catalano, 2017). These changes however are not the same in the country. There is a big variation in cherry orchard innovation between the north and the south of Italy. For instance, Puglia in the south, represents 62% of the national cherry area, but contributes only 33% of the total national production (Tab. 1). This is due to the lack of orchard innovation. Apricot, almond and citrus crops compete with the cherry market, thus lowering the market price. The picture in north Italy such as Trentino in the alpine region is different. With no competition with other fruits in a single growing season, cherries hold an optimum spot in the market. This is a good incentive to plant HDP cherry orchards.

Sweet Cherry in Trentino region

Sweet cherry, in Trentino, until the 1990's has been trained to a wide-spaced, tall, free standing tree grown on seedling, Colt, MaxMa vigorous rootstocks. The introduction of the dwarfed rootstock GiSelA® 5, in the last three decades, allowed new possibilities for developing HDP systems. These orchards are precocious, increase yield performance and fruit quality (Whiting et al., 2005). In addition, the introduction of new high fruit quality late cultivars such Kordia® Attika and Regina led to enhance the interests in cherry crop by the growers in the region (Franchini and Pantezzi, 2017). Growers are moving very fast towards modern HDP systems using feathered trees at planting time, ready to produce already in the second year. Tree density can range from 1000 to 2000 trees/ha (400-800 trees/acre) with a tree space distances from 3.5 to 4 m. (138-158") between rows and from 1.5 to 2 m. between trees (59-79"). An alternative training system recently available to the growers is the Bi-axis trees, achieved by the double chip budding (Bibaum® tree) technique, patented by Mazzoni nursery in Italy (Fig.1).

Several training systems have been studied at the Research Institute of Edmund Mach Foundation (FEM) for HDP cherry orchard with an intent to increase yield and fruit quality. The Bi-axis system showed the best yield performance thus far in all the trial sites (Fig. 2). The Upright Fruiting Offshoot (UFO) had similar yield than the traditional Tall Spindle Axe (TSA) system, but requires higher tree density to increase yield having narrower canopy. This planar multi-stemmed system was introduced by Whiting (2009) to improve worker safety and harvest efficiency. Tree architecture has shown to have an important effect even on labor efficiency according to Ampatzidis and Whiting (2013). The Kym Green Bush (KGB) system could be interesting in the mountain areas were mechanization is not possible but lacks production in the first years (Fig. 3). Moreover, it is not suitable for single row netting system.

Nowadays, cherry crop in the region represents 200 hectares with a production of 1300 tons, a niche compared to other cherry areas in Italy (Tab. 1). New areas in Trentino at different altitudes such as in the Non Valley, a leader in apple production, is showing remarkable interest by both producers and fruit industry and today represents 1/3 of the surface area of the region (Tab. 2).

Furthermore, Trentino region has an occurrence of frost, hail and rainfall, which can affect cherry crop. However, the key issues in the region, as in many cherry areas in the world, is the Spotted Wing Drosophila

(SWD) (*Drosophila suzukii*) (Lee et al., 2011). Thus, in order to have a secure production of cherries, orchards need to be covered with rain shield against cracking and with nets against hail and SWD. This naturally requires a higher cost of investment (Tab. 3), which might be a challenge to growers. Several netting systems can be used: total (TC) or single row covering (SRC) (Fig. 4 & 5).

SWD issue

Drosophila suzukii appeared for the first time in September 2009 on cherry and other crops such as small fruit, apricot and wine grape. In 2011, production loss was estimated around 3 million € (3.48 million $). In addition, SWD can count on the presence of numerous spontaneous hosts in the forests that cover usually much of the surfaces around the cherry orchards in Trentino. Some of the most common hosts are wild cherry (*Prunus ssp*.), spontaneous bush (*Rubus ssp.)*, elder (*Sambucus nigra, L.)* and ivy berries (Hedera helix, L.)

Monitoring of SWD started in 2010, and showed a progressive demographic increase year after year, due to a combination of many agro-environmental factors. In addition, global warming over the last years, led SWD to find an ideal environment in the Trentino region. Warm fall seasons, are favorable climatic conditions for SWD, which help in preparing for the winter. In the last years, mild winters have seen a decrease in the mortality rate of SWD. Relative humidity in summer is generally quite high and although high temperatures can be negative for the development of SWD, the presence of wooded areas at different altitude levels provide a favorable microclimate. Moreover, SWD has large displacement properties that allow it to escape the excessive heat from the ground areas of Trentino to higher altitude sites, where crops and spontaneous species mature at different time. At the end of the season, when temperatures and photoperiod diminish, SWD adults move back to the warmest ground areas. In addition, the absence of specific parasitoids favor the demographic explosions.

Over the past two years, peak populations of considerable intensity have been reached in July, the main pick season for cherries in Trentino (Fig. 6). While in 2016, cherry maturity matched with the appearance of SWD demographic peaks resulting in a massive damage, in 2017 cherries ripened earlier limiting the attack by SWD. Nevertheless, Trentino is one of the areas with the highest intensity of SWD development.

Strategies against SWD

Chemical control

Chemical control often appears not to be effective. Usually the strategy consists of four treatments starting from when cherries change color until seven days before harvest (Fig. 7). When netting is used, only the first treatment (useful for cherry fly) is applied.

Integrated Pest Management (IPM) strategies

The integration of multiple methods and measures, based on IPM practices, are crucial to achieve good results against SWD:

- Pruning helps to reduce humidity within the canopy, enhance light penetration and facilitates spray insecticide applications.
- Frequent mowing helps to reduce humidity and the use of mulches can creates hot/dry microclimate, not favored by SWD.
- Rain shield application helps to avoid insecticide loss but increases their persistence.
- Mass capture, carried out on woody margins of cherry orchard during winter and in all the phases of fruit absence, can help reduce adult populations.

Netting

Netting when applied at the time when cherries are changing color is the most effective strategy (Fig. 8). It reduce chemical use lowering fruit residual at harvest time. SRC system helps orchard management operations but can enhance temperatures under the net, which promotes attacks of red spider mite

(*Tetranychus urticae*). The long-term effects of nets on tree physiology could also affect bud differentiation. This is an on-going study at FEM.

Use of parasitoids

The introduction of native parasitoids in the areas of origin of SWD is not allowed in Italy both by national and European laws.

The interest for biological control forms has therefore turned directly towards indigenous general species. Trial conducted at FEM have shown interesting preliminary results on parasitize SWD. *Trichopria drosophilae (Td)* results to be one of the most effective species. The field trial, conducted in 2017, has shown that early mass releases of *Td* significantly reduce spontaneous and uncultivated early cherry infestations, a source of adult development that will affect commercial cherry crops.

Further systems are being studied to implement the effectiveness of this useful insect, as well as investigations to exploit the potentials of other indigenous Hymenoptera parasitoids.

Attract and kill

FEM is particularly focused in the development and evaluation of attracting and killing fighting systems, which provide a sustainable use of insecticide active ingredients. In 2017, the effectiveness of an experimental formulation under development has been verified in the field. In the face of a high pressure of SWD, the results were not satisfactory in containing the damage, although there has been a significant effect on the reduction of the number of adults.

Training systems

FEM since 2010 has been studying alternative HDP cherry orchards by using 2D training systems such as Bi-axis and Upright Fruiting Offshoot (UFO). Moreover, the use of a more dwarfing genotype such as GiSelA®3 could be a good alternative adopting the tall spindle systems in fertile soil conditions. These systems have a compact tree architecture (Fig. 9), which are easier for the application of netting systems.

Conclusions

- ✓ Crop Protection with insecticides is not sufficient!
- ✓ Netting is the most efficient strategy so far in Trentino region
- ✓ Single row net is interesting but needs to consider the following:
  - ✓ Netting size
  - ✓ Spray distribution efficacy within the canopy
  - ✓ Spray reduction
  - ✓ Cost
- ✓ 2 D systems such as Bi-axis and UFO are better suitable for single row netting cover
- ✓ Bi-axis are preferred in the new plantation because it produces high yield and fruit quality and it is easy to manage.
- ✓ The use of commercial parasitoids and/or predators may help to reduce SWD in HDP cherry orchard

Literature

Ampatzidis, Y.G. and Whiting, M.D. 2013. Training Systems Affects Sweet Cherry Harvest Efficiency. HortScience 48: 547-555.

Franchini, S. and Pantezzi, T. 2017. Si espande la cerasicoltura nelle Valli del Noce. Frutticoltura 4: 20-22.

Lee, J.C., Bruck, D.J., Dreves, A.J., Ioriatti, C., Vogt, H. and Baufelde, P. 2011. In Focus: Spotted wing drosophila, *Drosophila suzukii*, across perspectives. Pest Manag. Sci. 67, 1349–1351 https://doi.org/10.1002/ps.2271. PubMed

Sansavini, S. and Catalano, L. 2017. Coltivazioni in frenata: investimenti alti e rischi inevitabili. Frutticoltura 4: 4-7.

Whiting, M.D., Lang, G. and Ophardt, D. 2005. Rootstock and training system affect sweet cherry growth, yield and fruit quality. HortScience 40, 582–586.

Whiting, M.D. 2009. Upright fruiting offshoots. Prosser, WA: WSU-IAREC. Retrieved March 8, 2011, from http://fruit.prosser.wsu.edu/UFO.html.

Figures and Tables

State/ regions	Surface (ha)	Surface (%)	Yield (tons)	Yield (%)
Puglia	18.609	62.1	32.768	30.5
Campania	3.182	10.6	26.307	24.5
Emilia Romagna	2.291	7.6	11.705	10.9
Veneto	2.239	7.5	13.805	12.9
Lazio	870	2.9	4.973	4.6
Sicilia	708	2.4	2.297	2.7
Calabria	383	1.3	3.361	3.1
Sardegna	299	1.0	1.425	1.3
Piemonte	282	0.9	2.087	1.9
Trentino	**200**	**0.6**	**1.300**	**1.2**
Lombardia	187	0.6	1.135	1.1
Abruzzi	180	0.6	1.635	1.5
Basilicata	174	0.6	994	0.9
Toscana	159	0.5	1.343	1.3
Alto Adige	100	0.2	600	0.7
Marche	84	0.3	344	0.3
Liguria	26	0.1	151	0.1
Friuli Venezia G.	24	0.1	184	0.2
Umbria	20	0.1	144	0.1
Italy	**29.970**	**100**	**107.296**	**100**

Tab. 1. Surface area and Cherry production in Italy. *Istat*

Site	Altitude m. a.s.l.	Surface (ha)	Surface (%)
Valsugana	400-900	95	48
Adige Valley	200-500	25	12
Giudicarie Valley	400-750	12	6
Non Valley	**400-900**	**68**	**34**

Tab. 2. Cherry production in Trentino region.

Fig. 1. Three year old Bi-axis tree.

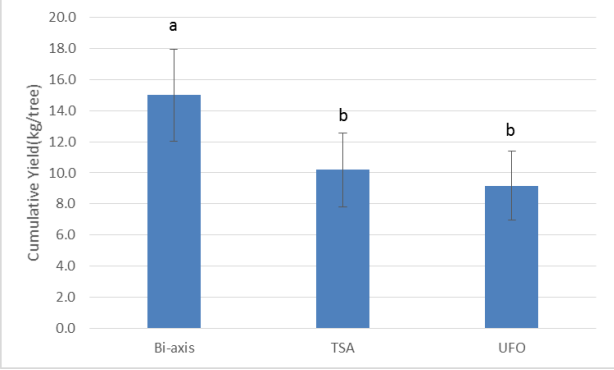

Fig. 2. (Right). Cumulative Yield (2013-14-15-16) of Bi-axis, TSA and UFO systems.

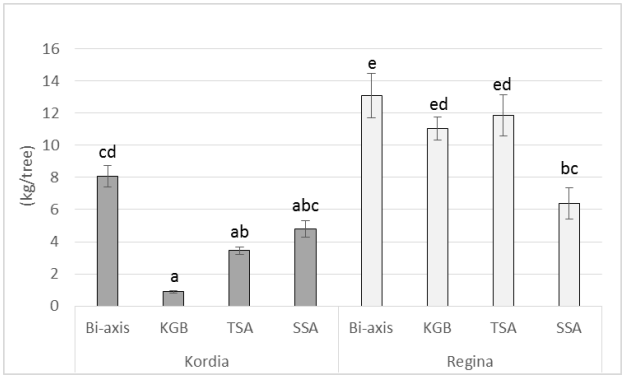

Fig. 3. (Left). Cumulative Yield (2014-15-16) of Kordia *cv* trained to Bi-axis, KGB, TSA and Super Spindle (SSA).

Systems	TC	SRC
Trees	15.430 $	15.430 $
Materials	52.430 $	65.080 $
Labor	26.680 $	26.680 $
TOTAL COSTS	**94.540 $**	**107.184 $**

Tab. 3. Total covering (TC) or single row covering (SRC) cost.

Fig. 4. TC (left).

Fig. 5. SCR (left).

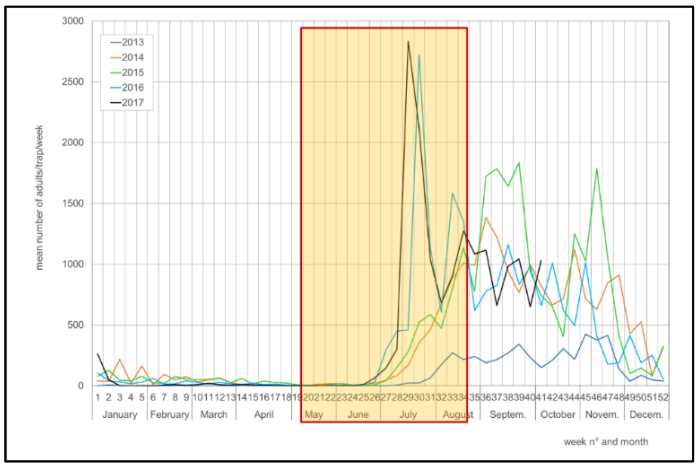

Fig. 6. Mean number of adult of SWD captured per week in the last 5 years.

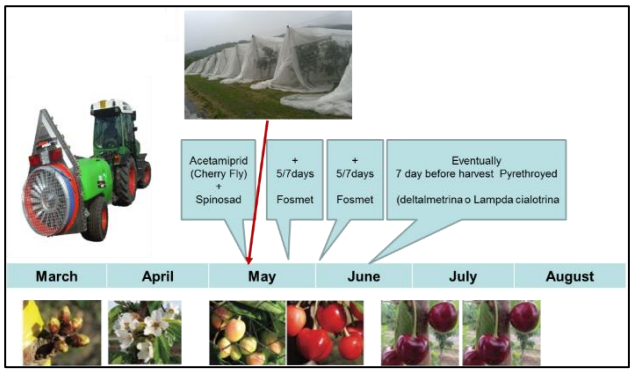

Fig. 7. Chemical strategy against SWD.

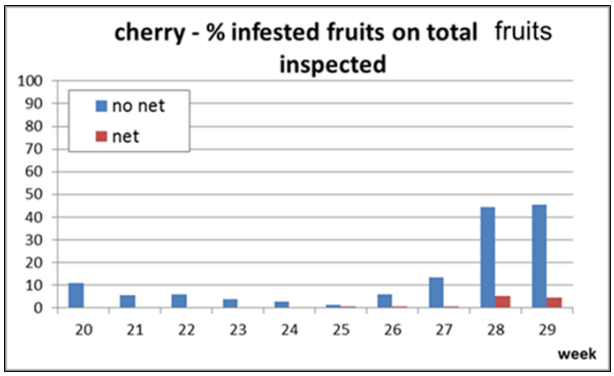

Fig. 8. Netting efficiency toward SWD.

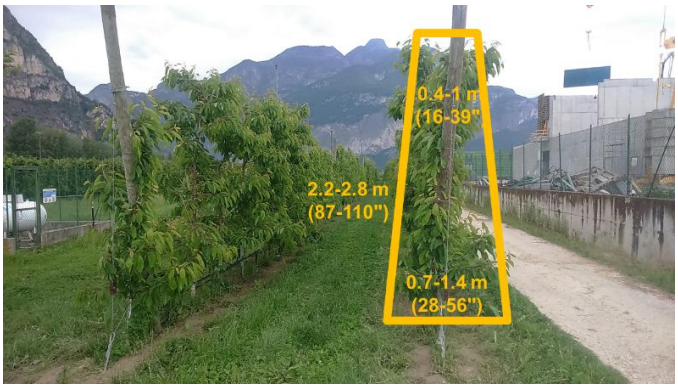

Fig. 9. Compact tree architecture in HDP cherry orchard.