

THE NATURAL SUSCEPTIBILITY AND ARTIFICIALLY INDUCED FRUIT CRACKING OF SOUR CHERRY CULTIVARS

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GENERALITIES

- **It is agreed that the rain combined with high temperatures further promote fruit cracking.**
- **The water absorption resulting in cracking, takes place through the skin of the fruit and it is directly correlated to the period and duration of rainfalls.**
- **Cracking occurs only in the wet fruits and only in that part of the fruit where free water is present.**
- **Different degrees of susceptibility are a result of cultivars genetic particularities (anatomical constitution of the pulp and fruit skin), which are reflected in the fruit's capability to absorb varying water amounts before cracking occurred, consequence of different resistance of fruit to turgor pressure**

- Climatic conditions during the days before and after the rain are supposed to be of importance for this phenomenon.
- The temperature strongly affects the rate of cracking; being in connection with the viscosity of liquids, permeability and biochemical processes.
- The cracking susceptibility is greatly increasing in the last part of the third growth phase of the fruit, and reaches a maximum at about the optimum maturity.
- The existing literature on the cracking susceptibility, in overwhelming majority, gives the information relating to the sweet cherry, while the references on sour cherry are disparate and limited.
- In Romania, in the field, sour cherry cracking is noticed rare, but, it can limit the commercial growing in the altitudinal humid areas.

Question was if

Sour Cherry Fruit Crack or No ?

- A widespread opinion between growers and even researchers less involved in cherries is that sour cherry fruit not crack.
- The purpose of study was to point that the sour cherry fruit cracking is a phenomenon which occurs naturally in the field and more particularly in the experimental conditions.

METHODS

- During *two years, one hundred* sour cherry genotypes were evaluated regarding their fruit cracking susceptibility in the RIFG Germplasm Found.
- The observations were carried out one year **in the field**, in the favorable meteorological conditions to promote the natural fruit cracking, and **in the laboratory**, where, this phenomenon was artificially induced **immersing sour cherry fruit in distilled water**.
- In the **controlled conditions**, **65 varieties** were investigated two years and **35 one year**, counting the damaged fruits after **6 and 24 hours**.
- **Samples**, formed by **100 fruits** from each cultivar, were collected at optimum maturity time, in the morning ,and after maximum 1 hour were **immersed in water at 24 +/-1 °C**.
- **Twenty varieties** were checked, **one year**, at **two moments of ripening phenophase**, a week before the fruit's full maturity and at optimum harvesting time.
- The **varietals differences** were estimated according to the **percentage of damaged fruits after 6 and 24 hours** of submersion.
- **Differences** in cracking susceptibility between **varieties**, **years** of experimentation, and **various ripening moments** were estimated using **F test and mean separation Duncan's multiple range test**.

FIELD RESULTS

- In the first year of experiments, June was one of the most humid and hottest. According to the statistic data, probability of repetition of such high daily temperature average occurred once in 15 years, and high atmospheric humidity once in 10 years.
- In the first two decades of June, precipitation accounts for a total of 103.7 mm, with high frequency between 8 and 15 June, when fruits were wet 119 out of 192 hours.
- In this circumstances (high level of precipitation against the background of a relatively high temperature), sour cherry fruit cracking was induced naturally .
- Many varieties cracked at the end of the third fruit growth phase, and/or at the maturity time.
- The most affected cultivars were 'Mari timpurii', with 15% cracked fruits, closely followed by 'Anglaise Hative' and 'Satmarean' with 12% damaged cherries. The cracking rate was 5% in 'Royal Duke', 'Favorit', 'Meteor Korai' and 'Transparente d'Espagne', and 4% in 'NY 9076', 'Drobeta', 'Tarina' and 'Timpurii de Pitesti' cvs.

- By comparison, **in the second year, weather** in the sour cherry ripening period **was dry and warmer** than seasonal average characterized by high insolation, daily temperature almost constantly between 20-25°C, low atmospheric humidity, rare and low quantitative rainfalls.
- Under these climatic conditions, **fruit maturity was advanced** with **6 days for early** varieties and **10 days for late** cultivars.
- As well, **cracking did not occur.**

LABORATORY RESULTS

- Data regarding **artificially induced tendency to crack of 65 sour cherry genotypes were generally higher in the first year for the percentage of cracking fruits after 6 hours of immersion in distilled water.**
- **In the second year, environmental atmospheric conditions were more favorable to the transpiration process.**
- Under these circumstances, a **high transpiration rate has determined a low water retention in cherries (which were slightly dehydrated) and, subsequently, had an effect on the water absorption during the first part of immersion (until the normal turgor pressure was reached).**

- **Percentage of cracked fruits varied from 0 to 32% (except 3 hybrid selections) after 6 hours of submersion, and from 0 to 100% after 24 hours among cultivars within each year of investigation.**
- **Generally, the number of split cherries after 6 hours was higher in first year when, in the field, the weather conditions promoted high turgidity in the fruits.**
- **Statistically, after 6 hours, according to the F test and Duncan test, there are very significant ($P \leq 0.001$) differences between the variants (varieties), and repetitions (years of study), and between cultivars after 24 hours of immersion.**
- **No significance was found comparing data recorded in different experimental years after 24 hours.**
- **Cracking susceptibility was highest at the cherry's full maturity compared with the less ripe fruits being significantly ($P \leq 0.05$) different between cultivars and very significantly ($P \leq 0.001$) between distinct harvesting moments.**

- **On the whole, in laboratory conditions, cultivars of all harvesting season showed various degrees of cracking susceptibility, but most particularly the early ripening ones.**
- **The most affected were 'HV 35/36', 'HV 10/12', 'Royal Duke', 'Dobraya', 'HV 35/30', 'Bizighesti', 'Turcesti', 'HV 12/105', 'Kelleris 16', 'Transparente d'Espagne', 'Granatnaya', 'Mari Timpurii', 'Crisana 15/10' and 'NY 6935', in contrast with 'Milwavre', 'Ludwigs Friihe', 'Olivet', 'Gorsemkric', 'Richmorency', 'Marasca Moscata' and 'Montearly'.**

DISCUSSION

- Recorded data show that the **sour cherry cultivars** have, in the humid climatic conditions, a similar behavior to **sweet cherries** (even if cracking tendency affects a lower percentage of fruit).
- The **highest cracking susceptibility** of early ripening varieties, of which many are **Duke cvs.**, is most likely a consequence of their **sweet cherry lineage**.
- The main **weather factors** having a great influence on the rate of cracking are the **quantity and duration of rain**, combined with the **temperature, atmospheric humidity** and **insolation**, before and during the ripening season.

- **The lower percentage of cracked fruits recorded in the second year, in the laboratory conditions, is associated with the drought during the ripening season, which caused a low turgidity of the sampled cherries.**
- **The divergent results are ascribed like expression of supposed lower capacity to water absorption.**
- **To put in evidence the sour cherry fruit cracking susceptibility is necessary a longer period of immersion; appearance of the splits starting hardly after 4-6 hours of wetting duration .**
- **For this reason the Vittrup-Christensen cracking index need to be adapted.**

***THANKS FOR YOUR
ATTENTION !***