Incidences of Fertileader Elite® foliar spray applications on the improvement of Fruits quality and their conservation. Trials realised on Pink Lady® Cripps Pink Cov.

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Abstract Improving fruits Quality, by limiting the defects of aspect, remains a major concern of the Producer. This concern certain varieties, such as Pink Lady® Cripps Pink Cov, who present an increased sensibility in the manipulations, not compatible with the requirements of specifications of varieties clubs lauding a high visual quality for their marketing. Morphogenesis and fruit Quality can be directly influenced, by hormonal foliar sprays like iso-pentényl-adénine (IPA), who demonstrated their efficiency on the activation of transport systems in the plant. In this context, the aim of this paper is to study the incidence of foliar sprays of Fertileader Elite® formulated on a Seactiv base (patented molecular complex of IPA, obtained from marine seaweeds) applied either in post thinning, or in summer applications. A comparative field trial was conducted by the Station expérimentale La Pugère, in 2008, following a randomized 4 blocks trial. Results showed that the Fertileader Elite® treatment, following 3 summer applications of 5 L/ha, in replacement of 3 first Calcium Chlorine treatments, contribute to improve appreciably the holding of apples in cold room by a better preservation of the firmness of fruits. On the other hand the Fertileader treatment minimize in a not insignificant way the appearance of bruises due to the shocks realized in the harvest and after preservation, and estimated according to the procedure developed by the Centre Technique Interprofessionnel des fruits et légumes (Ctff-France).

Key words Apple, fruits quality, shelf life, foliar sprays, Seactiv, Fertileader

For an apple producer, to improve the quality of the finished product and to limit the defects of aspect are key factors of the profitability of an orchard. Certain varieties, such as Pink Lady® Cripps Pink cov, presents a sensibility increased in the manipulations, not compatible with the requirements of specifications of varieties clubs lauding the high visual quality for their marketing.(5). The morphogenesis and the quality of fruits can be influenced, directly, by foliar applications of type Iso-pentényl adenine (IPA) which have demonstrated their efficiency on the activation of the systems of transport of numerous substances in the plant (1). This nutritional activation with fertilizing elements (nitrogen, phosphorus, potassium, trace elements), as well as of nourishing elements (amino acids, sugars) present all its interest to strengthen the quality of fruits and thus their preservation.

The Fertileader Elite®, fertilizer directly issue from the ROULLIER Group R and D Department was formulated on a patented Seactiv base, molecular Complex of IPA extracted from marine seaweeds (6), and supplemented with fertilizing elements such as Nitrogen, Potassium, Calcium and Boron.

An experimental study realised by the “Station d’Expérimentation LA PUGERE” allowed estimating directly in an orchard of apple trees, the effects of Fertileader Elite® foliar applications, on the physico-chemical and cosmetic quality of fruits, at the harvest and after preservation. The study aims at validate the incidences of the Fertileader Elite® foliar sprays, on the physico-chemical quality, the preservation and the sensibility in the bruises of fruits of the variety Pink Lady® cripps pink cov.
This study also has allowed evaluating the optimal strategy of intervention according to:
- An axis improvement of the calibre and of the fruit colour during applications in post thinning, in the beginning of phase of cellular swelling,
- Or a nutritional axis through the valuation of the mineral balances of fruits (bitter pit and resistance in bruises) during summer applications.

**Materials and Methods**

2.1 Experimental data

The experimentation took place in South of France in Mallemort (Bouches du Rhône) in an orchard characterised by a Variety: Pink Lady® cripps pink, developed on a rootstocks: Pajam® 2 Cepiland, with a distance of plantation: 4 x 1.50 m, and an orientation of rows: north-south

The plot of land support in the orchard; fruit Shape: centrifugal axis with an age of 1st year of first leaf in 2000, Irrigation realised: by spraying under foliage.

The experimented modalities :
T0: untreated control; Bitter pit protection assured with calcium chloride flakes (5kg/ha)
M1: Fertileader Elite® (5L/ha); early applications in post thinning, 3 times: complete fall of small fruits.
Then 2 treatments in 15 days of interval
M2: Fertileader Elite® (5L/ha) summer applications, 3 interventions: in replacement of the first 3 treatments of calcium chloride.
The applications are realized by means of an atomizer with back (SOLO®) equipped with a centrifugal pump, on a water basis of 1000 l / ha (limit of the streaming).

The Trial is conducted under a randomized 4 blocks protocol, on an elementary plot of 3 trees framed by 2 buffer trees.

2.2 Data analyses

In the harvest:
- starting of the harvest at the optimal stage of maturity (starch, firmness and sugar) with + 50 % of pinkish face stage R4-R5, codes by Centre Technique Interprofessionnel des fruits et légumes (Ctifl-France) (2-3).

- Grading and colour selection by using of an electronic machine

Quality evaluations:
- In the harvest and after a period of preservation (3 months in Normal Cold), the firmness (kg/cm²) and the refractometric index (%Brix) was evaluated by using the automatic Pimprenelle apparatus.
- Notation Bitter Pit on a sample of 100 fruits by elementary plot of land and by picks.

The Resistance in bruises:
- In the harvest and after a period of preservation (3 months in Normal Cold), test in the “meurtrimètre Ctifl equipped with a 50 gram lead. And by using a fall of the lead of 4 heights (3)
(7 cms, 9 cms, 11 cms and 13 cms).
- Reading of bruises in + 24 hours and + 14 days.

**Results**

- Physico-chemical analysis

Measure of firmness are realized to characterize exactly the impact of the Fertileader Elite® on the physico-chemical qualities of the fruits during both pick and after preservation.

<table>
<thead>
<tr>
<th>Modalities</th>
<th>Harvest 1</th>
<th>Harvest 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Firmness at harvest (kg/cm²)</td>
<td>Firmness After storage (kg/cm²)</td>
</tr>
<tr>
<td>T0</td>
<td>8.2 ns</td>
<td>6.4 ns</td>
</tr>
<tr>
<td>M1</td>
<td>8.0 ns</td>
<td>6.6 ns</td>
</tr>
<tr>
<td>M2</td>
<td>8.1 ns</td>
<td>6.6 ns</td>
</tr>
</tbody>
</table>

The measures of fruits firmness, realised at the harvest and after preservation, did not allow discriminating between the modalities, however, we can observe a variation of the evolution of the firmness of fruits according to the modalities. According to the statistical analyses, the loss of firmness in preservation of stemming fruits of M1 and M2 treated with the Fertileader Elite® was significantly limited compared to the control. The same tendency is noted for fruits stemming from the 2nd pick, but without statistical meanings.

Thanks to its composition in IPA and calcium, element participating in the formation of pectin chains between the cellular walls of fruits, Fertileader Elite®
facilitates the apples preservation after harvesting and after storage.

- Evaluation of bruise resistances
  To evaluate the resistance of fruits at bruises, induced by the Fertileader Elite® foliar spays, the “Station d’Expérimentation LA PUGERE” has proceeded to trials using the meurtrimètre. This device developed by Ctifl allows to measure in a reproducible way the sensibility in bruises. The modelling of this sensibility allowed Ctifl to define an indication, Sensifel®. This indication corresponds to the theoretical height which breeds 50% of bruises. The more the value is low and the more the batch presented a weak resistance.

The reading of bruises took place in two stages. A 1st notation is realized 24 hours after the shock to visualize the maximal expression of the bruise, then a 2nd notation after 14 days in cold room to estimate the regression of the bruise after passage at the cold.

### Table 2

<table>
<thead>
<tr>
<th>Modality</th>
<th>Pick 1 - 24 h</th>
<th>Pick 1 - 14 j</th>
<th>Pick 2 - 24 h</th>
<th>Pick 2 - 14 j</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0</td>
<td>8,2 ns</td>
<td>12,3 ns</td>
<td>3,9 ns</td>
<td>7,8 ns</td>
</tr>
<tr>
<td>M1</td>
<td>8,0 ns</td>
<td>11,6 ns</td>
<td>3,5 ns</td>
<td>8,3 ns</td>
</tr>
<tr>
<td>M2</td>
<td>9,5 ns</td>
<td>12,3 ns</td>
<td>5,4 ns</td>
<td>9,1 ns</td>
</tr>
</tbody>
</table>

For fruits issues from the 1st pick, the value of the Sensifel® index is more elevated than the average indication (6,6) measured from 1999 till 2006 for this variety by Ctifl. At contrario, the Sensifel® index of fruits of the 2nd pick is exceptionally low. Very bad climatic conditions (Strong rainfalls) between both passages of harvest engendered a turgescence of fruits cells, amplifying their sensibility to the small shocks.

According to the statistical analyses of variables “Sensifel® index” after both harvests and for both notations, elements of decision do not allow us to conclude in the absence of significant difference between the modalities. However, according to the Ctifl experience, one point difference of the index allows to estimate the tendency of a variation to bruises sensibility. Thus, we can note a decrease of the appearance of bruises within the modality M2 with regard to the control, in particular after very unfavourable climatic conditions.

Summer Fertileader Elite® applications allowed improving appreciably the resistance of fruits to manipulations and shocks.

### Discussions and Conclusion

This experiment, realised by the “Station d’Expérimentation LA PUGERE” had for objective to evaluate the effects of the Fertileader Elite® foliar applications, on the improvement of fruit quality, and their conservation

Beyond a study of efficacy, this trial aimed at determining the optimal strategy of using with the comparison of two step of the applications, either in the beginning of phase of cellular swelling (at the end of May - the beginning of June) or on an axis improvement of the size or in replacement of the first three treatments bitter pit on an “nutritional axis “

The variety Pink Lady® cripps pink cov was selected as a variety support because of its qualitative requirements (calibre, colour, special skin without external defects) and its very strong sensibility in the manipulations.

If, in the harvest, the physico-chemical measures (firmness) of stemming fruits issues from both picks do not bring to direct effects after preservation, we demonstrate that the treatment of the Fertileader Elite® contributes to improve appreciably the holding of apples in cold room by a better preservation of the firmness of fruits.

The appreciation of the variation of sensibility in the bruises of the skin of fruits, according to the strategy of spring or summer fertilization is realized by the definition of the Sensifel® index.

Without obtaining statistically significant results, the summer applications of Fertileader Elite®, in replacement of the first calcium chloride applications, allow to minimize in a not insignificant way the appearance of bruises further to the shocks realized in the harvest and after preservation, and the same on fruits subjected to extremely unfavourable climatic conditions.

The results obtained after this 1st year of experiment are very encouraging and highlight the interest of the Fertileader Elite®, with a summer location for the aspect decrease of bruises and improvement of the holding of fruits in storage.

Specialists of plant Nutrition, the scientists of ROULLIER Group, through partnerships with the public Research and agronomical Universities, develop innovative solutions, such as the range of bio...
stimulants Fertileader, to improve the profitability of the productions in specialized crops.

References