Infestation Levels by Aphids on Two Orange Varieties, in the Orchard

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Résumé

La sélection des variétés résistantes est parmi les méthodes proposées pour résoudre les problèmes engendrés par l'utilisation des pesticides chimiques. Dans cette étude, le degré de résistance de 2 variétés importantes d'oranger (Thomson Navel et Double Fine Améliorée) vis-à-vis des pucerons des agrumes, a été évalué à travers un comptage mensuel des pucerons sur 16 feuilles/variété à partir du janvier jusquà juin 2014. De plus, quelques caractéristiques morphologiques des feuilles des cultivars examinés ont été déterminées. En outre, d'autres comptages des aphides et une analyse du contenu minéral des feuilles ont été effectués au cours de la poussée de sève d'automne et du printemps. *Aphis spiraecola* était la seule espèce aphidienne identifiée, et les auxiliaires n'ont été pas observés. En plus, les feuilles de Thomson Navel, qui était la plus infestée, semblent plus grandes. Cependant, l'analyse statistique de la relation entre les niveaux d'infestation et les quantités des minéraux foliaires (phosphore, potassium et sodium) n'a pas montré une corrélation significative.

Mots clés: Niveau d'infestation, Pucerons, Oranger, Thomson Navel, Double Fine Améliorée

Introduction

Citrus fruits are important crop worldwide (Pefia and Navarro, 1999). Sweet orange *Citrus sinensis* alone accounts for 75 % of the total citrus fruit production worldwide followed by mandarin, grapefruit and lemon (Singh and Rajam, 2009). They suffer from many pests, such as aphids, that may reduce significantly the production. Aphids in sufficient numbers may cause wilting and stunted growth. They have a role as vectors of disease-producing viruses (Gillott, 2005). The most prevalent method for controlling aphid infestation is application of high doses of agrochemicals but it is cost intensive in addition to being environmentally hazardous (Bhatia *et al.*, 2011). Moreover, there are reports of aphid species that have developed resistance to various chemical insecticides (Sullivan, 2008).

To resolve these problems generated by the use of chemical pesticides, many methods were proposed. Of them, the use of resistant varieties seems to be the most important because of their economic, ecologic and healthy advantages. Among methods that enhance sustainability, integrated pest management which emphasizes plant varieties that have high resistance to pests (Horrigan *et al.*, 2002). Even if only moderate levels of resistance are combined with pesticide applications, the costs of insecticidal control and insecticide residue problems are greatly reduced (Smith, 2005).

In this context, we conducted this study which have two main objectives :

1. Screening the resistance degree to citrus aphids, in the orchard, of 2 important orange varieties 'Thomson Navel' and 'Double Fine Améliorée' ;
2. Studying the relation between the infestation levels of trees by aphids and some morphological and chemical characteristics of leaves of the examined cultivars.

Materials and Methods

➢ This study was carried out in an orchard in Skikda province (the northern part of Algeria) (figure 1)

Figure 1: Situation of Skikda province

➢ Some leaf characteristics of the tested orange cultivars (Thomson Navel and Double Fine Améliorée) were determined.
➢ Additionally, monthly samplings were carried out from January to June 2014.
➢ Other counts of aphids on leaves were taken in October 2014 and April 2015, which correspond to the autumn and the spring flush of growth respectively.
➢ Leaves were collected in the same periods and then analyzed to quantify their contents in phosphorus (using colorimetry), potassium and sodium (via photometry with flame).

Results

At the end of this investigation, only *Aphis spiraecola* was identified as aphid pest of the tested orange varieties, and no auxiliaries were recorded. Generally, Thomson Navel sustained higher numbers of aphids than Double Fine Améliorée (figure 2), although there was no statistically significant difference for all months of the study.

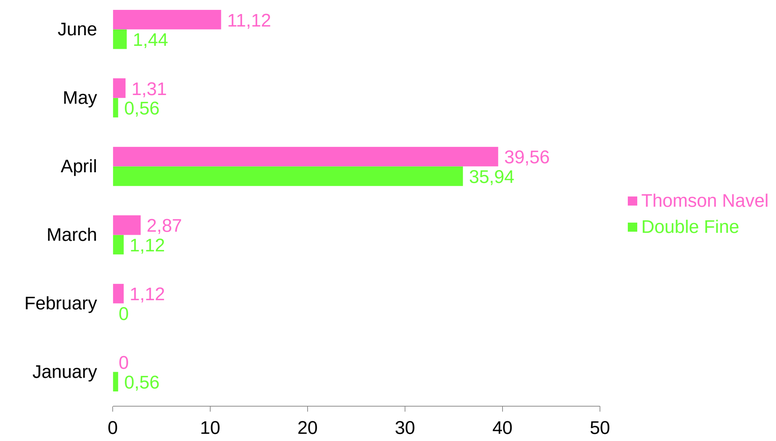

Figure 2: Mean number of aphids/leaf on Thomson Navel and Double Fine Améliorée from January to June 2014

Concerning the morphological characters, the two varieties have almost the same intensity of the green color, but the leaves of Thomson Navel, which is the most infested by aphids, seem bigger (table 1).

Table 1: Leaf morphological characteristics of the tested orange varieties

Variety/parameters	Mean length of the leaf (cm)	Mean width of the leaf (cm)	Green color of the leaf
Thomson Navel	8,70	4,47	Dark
Double Fine Améliorée	7,75	4,40	Dark

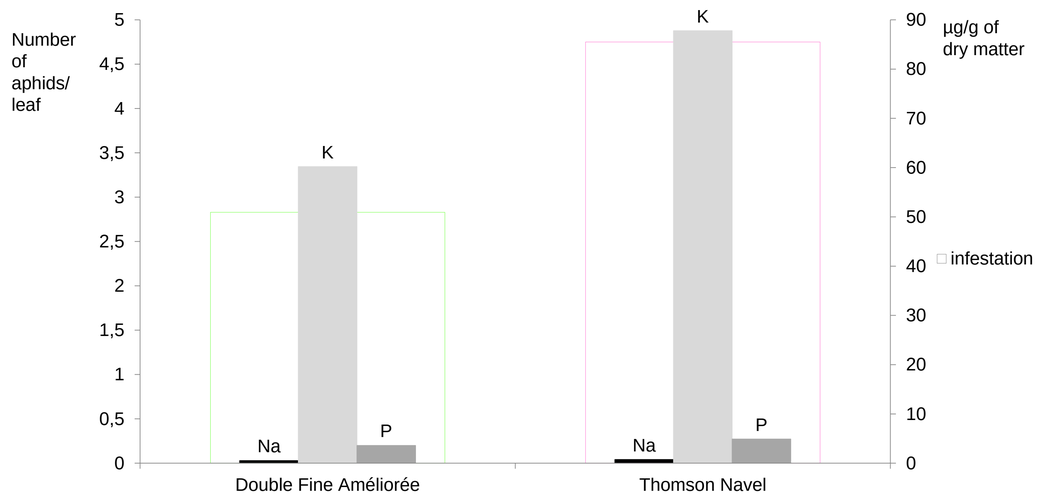

Figure 3: Mean number of aphids/leaf and amounts of leaf minerals in October 2014

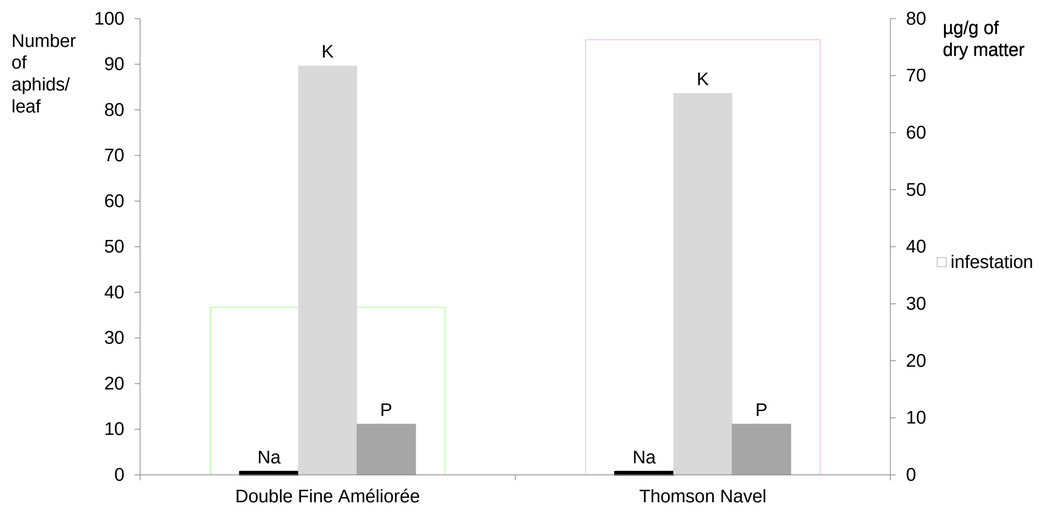

Figure 4: Mean number of aphids/leaf and amounts of leaf minerals in April 2015

The statistical analysis of the relation between the infestation levels and the quantities of leaf minerals did not show a significant correlation **(P > 0,05)**

Conclusion

'Double Fine Améliorée' presented some degree of resistance against aphids comparatively with 'Thomson Navel' which may reduce pesticides spraying and thus contribute to establishment a sustainable agricultural system. It seems also that the leaf size influenced the level of infestation, while the quantified leaf minerals had not a significant role in the selection of orange varieties by aphids.

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