

אקרית הקורים (*Oligonychus afrasiaticus*) בדקל התמר – מעורבות מדדים

פיזיולוגיים של הפרי בעיתוי העלייה והנסיגה של המזיק.

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תקציר:

אקרית הקורים (*Oligonychus afrasiaticus*) גורמת לנזקים כבדים לפירות התמר בערבה. עיתוי ועוצמת התפרצות אוכלוסיית המזיק במטעי הערבה הדרומית קשורים לשלב ההתפתחות של הפרי ומושפעים מאד מהזן.

במחקר קודם נמצא קשר בין עליית וירידת המזיק אל הפרי וממנו לבין תכולת המים וריכוז הסוכרים בפרי. מטרת המחקר הנוכחי היא לזהות בפרי מרכיבים תזונתיים ומטבוליטיים משניים העשויים להיות מעורבים במשיכת או דחיית המזיק.

בשנים 2007-2009 נלמדו במקביל צפיפות אוכלוסיית אקרית הקורים ותכולת מינרלים (תזונתיים ומבניים), כלל המומסים, חומצות אורגניות, פוליפנולים, כלורופילים וקרוטנואידים במהלך תקופת התפתחות הפרי מחנטה עד הבחלה בפירות משלושה זני תמר הנבדלים בזמינות למזיק ומועדי ההתפרצות - 'מג'הול', 'ברהי' ו'דקל-נור'. המחקר ב-2010 התמקד באנליזה דומה של פירות מהזן 'זהידי' שאינו זמין כלל לאקרית הקורים.

הידע שהתקבל במחקר יתרום למכלול השיקולים בניסוח תכנית להדברה משולבת של אקרית הקורים במטעי דקל התמר. כמו כן, ניתן ליישמו בתכנון הטיפוח בתמרים לעמידות לאקרית הקורים.

MERC Research Grant M24-024

“Integrated Control of the Date Palm Spider Mite”

Scientific Report, May – December, 2010

Objective 4B: *Relationship between fruit chemistry and mite phenology and population density.*

In compliance with Objective 4B, fruit chemical composition and mite phenology and population density were monitored bi-weekly during May through August concurrently on 'Medjool', 'Barhi' and 'Deglet Noor'. During 2010 the study was extended to a forth date cultivar, 'Zahidi', which is unsusceptible to the date spider mite. The experimental design included 5 trees from an organic orchard. Whole fruit were analyzed with respect to weight and water content. Fruit were further processed in a hard-fruit juice extractor and the extracted juice was chemically analyzed.

RESEARCH ACCOMPLISHMENTS:

In the previous reports we have described our results on 'Medjool', 'Barhi' and 'Deglet Noor' fruit mineral composition (including total nitrogen, phosphate, potassium, calcium, magnesium, sodium and chloride), chemical composition (including water content, juice total soluble solids' concentration, electrical conductivity, pH, titratable acidity and total soluble phenolics' content) and secondary metabolite profile (including polyphenolics, chlorophylls and carotenoids).

Mineral and chemical parameters changed similarly in fruit of the three CVs during development; however, the absolute values as well as the degree and rate of change of each parameter were cultivar dependent, indicating that fruit chemistry may indeed relate to cultivar susceptibility to the mite. The content of certain polyphenolics, chlorophylls and carotenoids in the three CVs varied parallel to seasonal changes in mite phenology and density, suggesting that they may play a role as constitutive attractants/repellents.

In the current report we present physicochemical parameters and secondary metabolite analysis in the developing fruit of 'Zahidi'. Detailed account on the analytical procedures was presented in earlier reports.

RESULTS

'Zahidi' fruit physicochemical parameters - Fruit weight, water content, juice total soluble solids (TSS) concentration, electrical conductivity (EC), pH, titratable acidity (TA) and total soluble phenolics content were measured during fruit development. The results are presented in Figure 1. All the parameters exhibited similar trends of changes to those measured previously in 'Medjool', 'Barhi' and 'Deglet Noor' during fruit development. The absolute values and rate of changes were however cultivar dependent. Especially notable are the relatively high values of pH and EC measured in 'Zahidi' fruit during most of the studied period compared to the values obtained in the three other CVs.

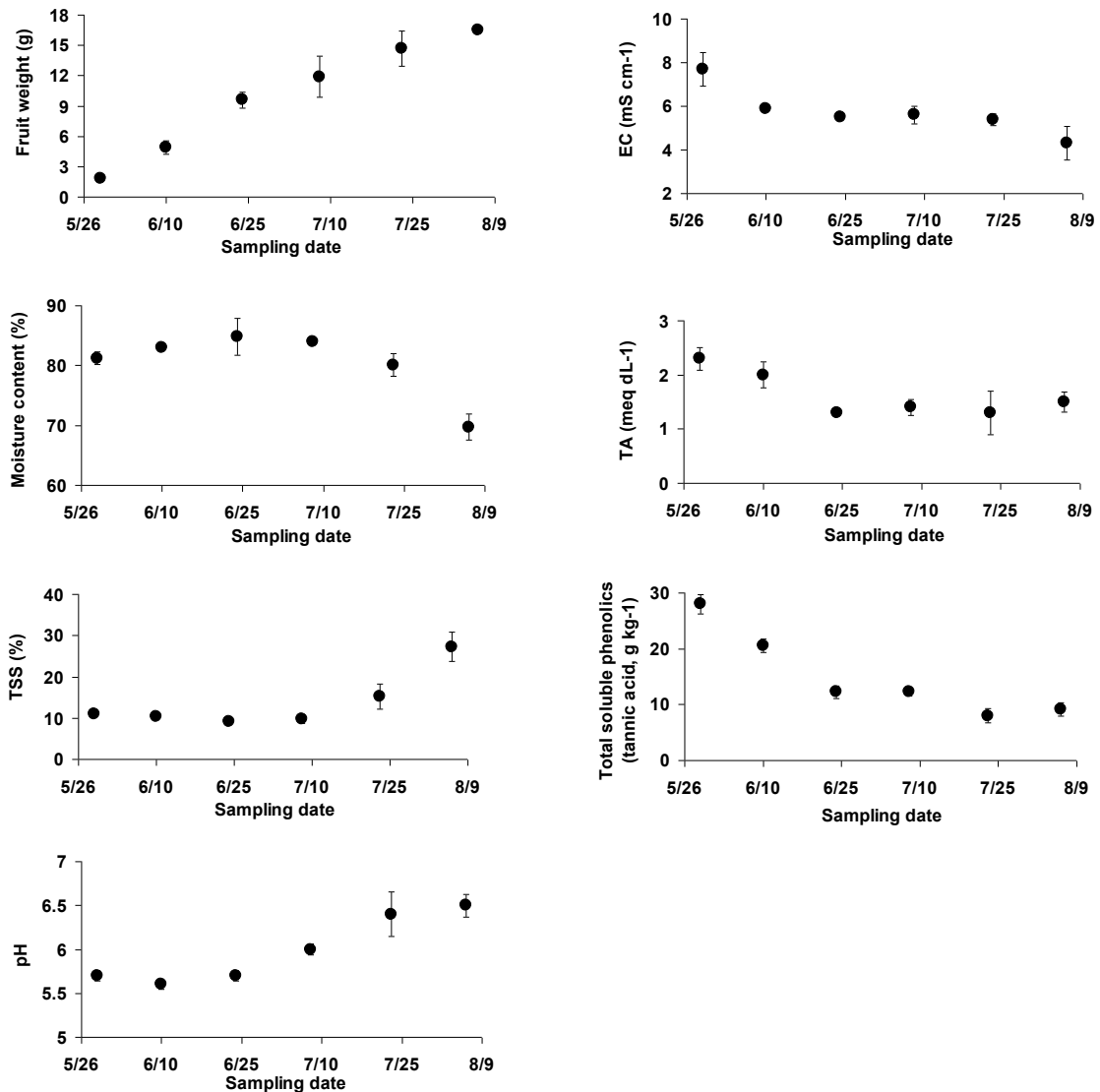


Figure 1: 'Zahidi' date fruit physicochemical parameters along fruit development.

'Zahidi' fruit secondary metabolites – The composition of polyphenolics, chlorophylls and carotenoids in the developing fruit was investigated by HPLC. The chromatograms obtained with 'Zahidi' fruit juice extracts were comparable to those obtained with the three other CVs; however, several distinct differences were detected.

Polyphenolics: Composites of fruit extracts from 5 trees were analyzed. Figure 2 depicts the change in tannins level during fruit development. As observed earlier with 'Medjool' and 'Deglet Noor' the level of tannins decreased initially but was high during the whole term of fruit development. The levels of total catechins (Figure 3) and phenolic acids (Figure 4) markedly decreased during fruit development, similarly to our previous observation with 'Medjool', 'Barhi' and 'Deglet Noor'.

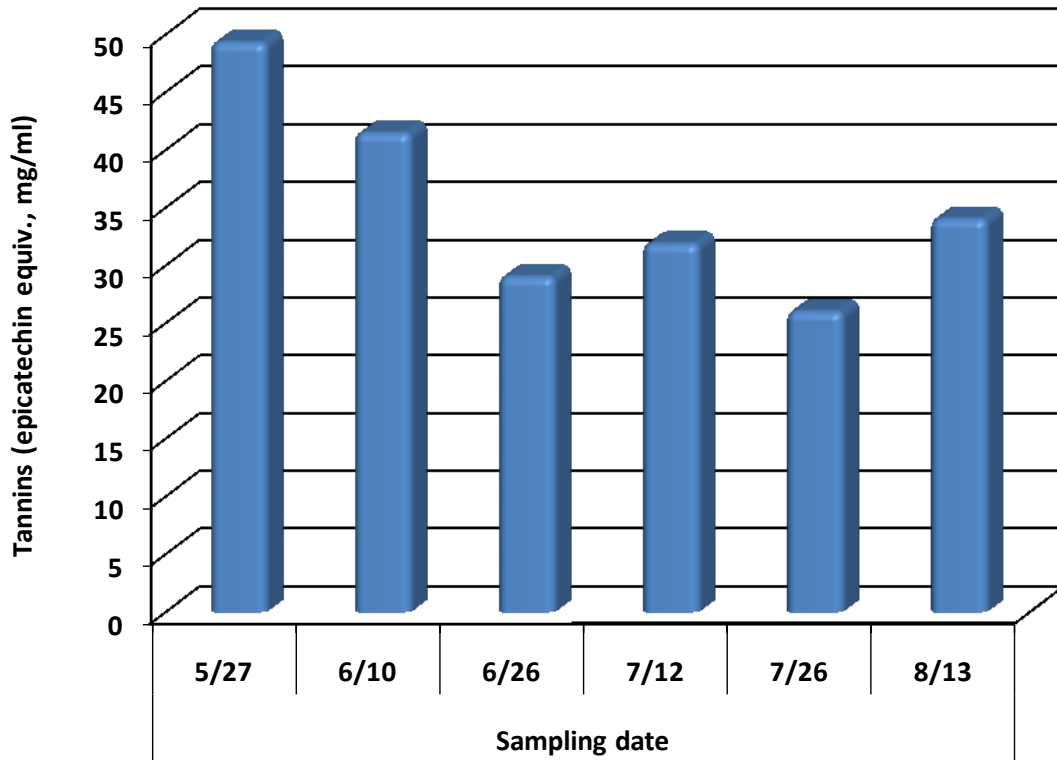


Figure 2: Tannin content in 'Zahidi' fruit along development.

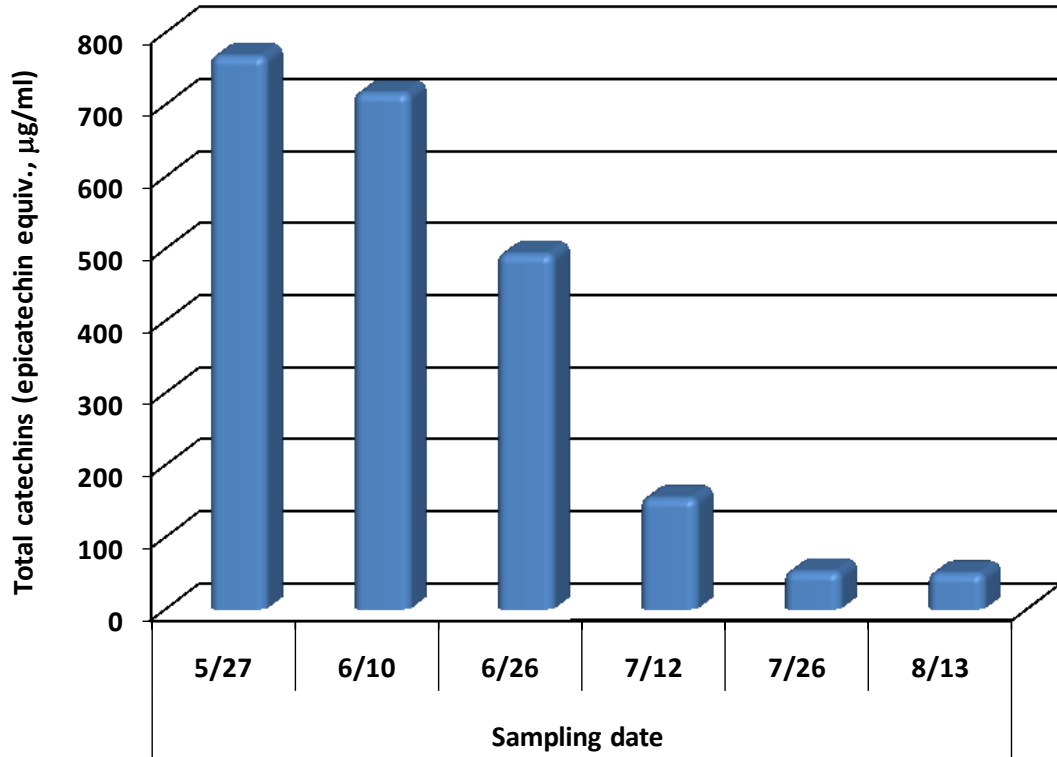


Figure 3: Catechins content in 'Zahidi' fruit along development.

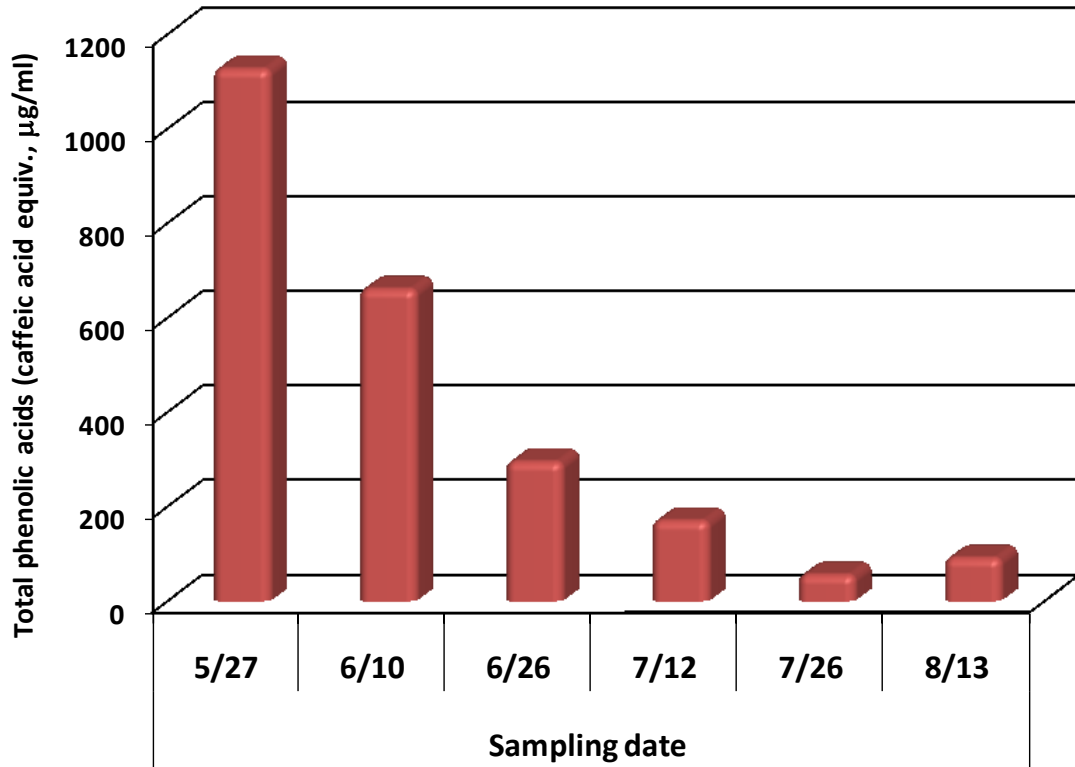


Figure 4: Phenolic acids content in 'Zahidi' fruit along development.

The changes in the content of individual catechins and phenolic acids during 'Zahidi' fruit development are presented in Figures 5 and 6, respectively.

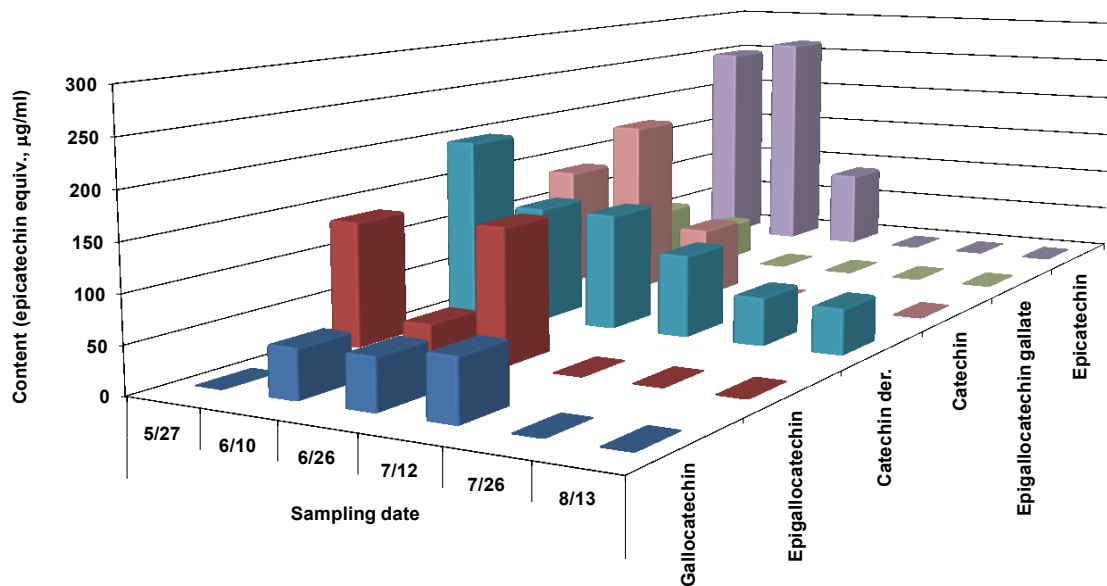


Figure 5: Changes in the content of individual catechins during 'Zahidi' fruit development.

The pattern of changes of the individual catechins during fruit development was similar to that measured earlier in 'Medjool', 'Barhi' and 'Deglet Noor' with the exception of epigallocatechin gallate; the latter increased during fruit development in the three other cultivars but decreased in 'Zahidi'.

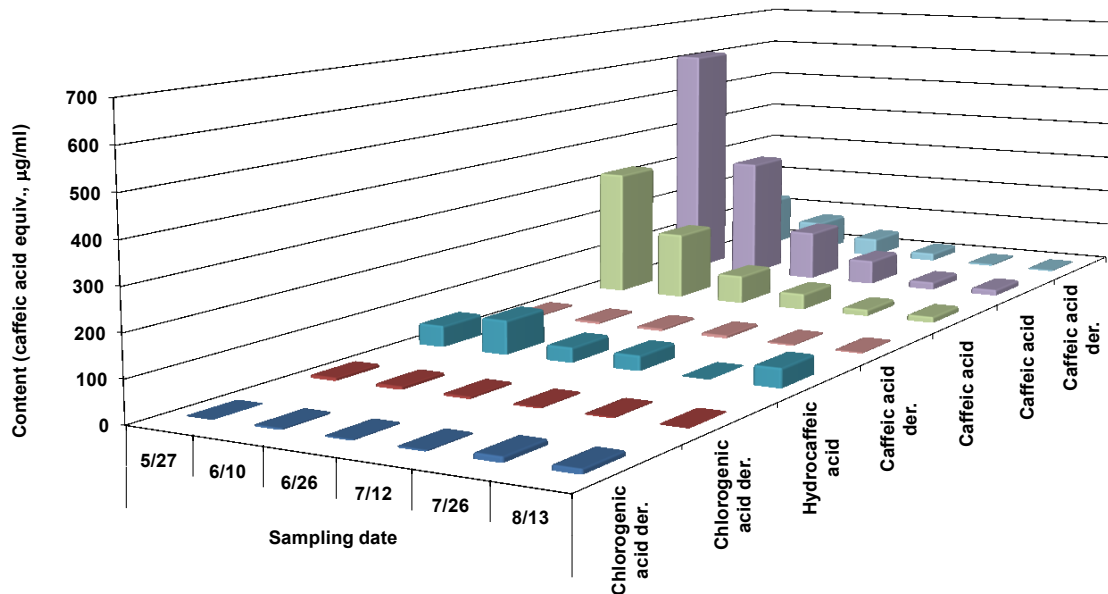


Figure 6: Changes in the content of individual phenolic acids during 'Zahidi' fruit development.

The pattern of changes of the individual phenolic acids during fruit development was similar to that measured earlier in 'Medjool', 'Barhi' and 'Deglet Noor'.

Chlorophylls and carotenoids: Composites of fruit extracts from 5 trees were analyzed. Chlorophylls and carotenoids composition (Figures 7 and 8, respectively) was analyzed in fruit extracts from sampling dates relating to three phases in the date spider mite seasonal phenology as established in the susceptible cultivars (Palevsky *et al*, 2005): phase 1 - preceding mite ascent (5/27), phase 2 - during population buildup (7/12), and phase 3 - at the beginning of mite descent (8/12). The chromatograms obtained with extracts of 'Zahidi' fruit consisted of similar peaks to those of 'Medjool', 'Barhi' and 'Deglet Noor' fruit extracts but peak area as well as the degree and rate of change during fruit development differed significantly. The major peaks were of chlorophyll a and b and their degradation products (pheophytins), lutein, β -carotene and several unidentified carotenoids (denoted as C1 to C10). The levels of chlorophylls and carotenoids were considerably lower in 'Zahidi' compared to the three other date cultivars, especially during phases 1 and 2.

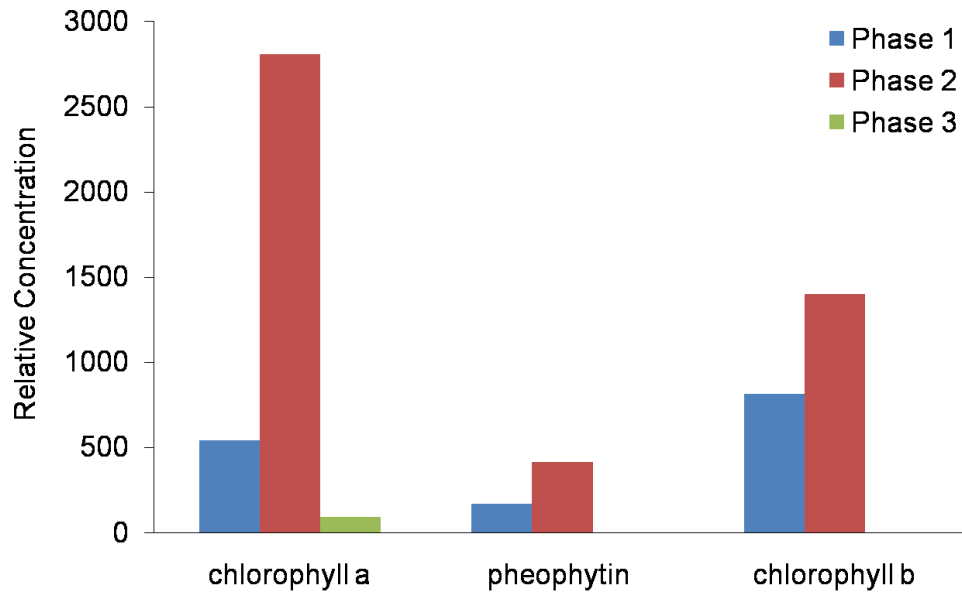


Figure 7: Chlorophylls and pheophytins' composition in 'Zahidi' fruit on several dates along fruit development. Phases 1, 2 and 3 denote sampling on 5/27, 7/12 and 8/12, respectively.

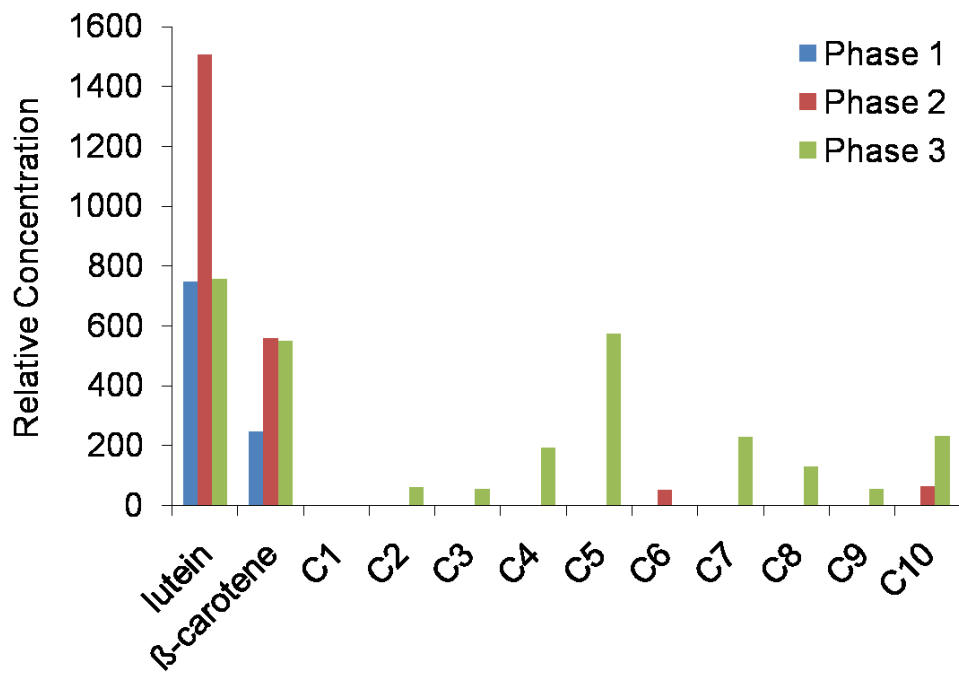


Figure 8: Carotenoids' composition in 'Zahidi' fruit on several dates along fruit development. Phases 1, 2 and 3 denote sampling on 5/27, 7/12 and 8/12, respectively.

FUTURE WORK

Objective 4B: *Relationship between fruit chemistry and mite phenology and population density.*

Data obtained during the entire study duration will be summarized with a special emphasis on the comparison between the mite susceptible and resistant date varieties to establish the involvement of certain fruit chemical components in mite attraction and repulsion.

REFERENCES

- Palevsky, E., Ucko, O., Peles, S., Yablonski, S. and Gerson, U. 2004.** Evaluation of control measures for *Oligonychus afrasiaticus* infesting date palm cultivars in the Southern Arava Valley of Israel. *Crop Protection* 23: 387-392.
- Palevsky, E., Borochoy-Neori, H. and U. Gerson. 2005.** Population dynamics of *Oligonychus afrasiaticus* in the southern Arava Valley of Israel in relation to date fruit characteristics and climatic conditions. *Agricultural and Forest Entomology* 7: 283-290.
- Shomer, I., H. Borochoy-Neori, B. Lutzki, and U. Merin. 1998.** Morphological, structural and membranal alterations in frozen tissues of Madjhoul date (*Phoenix dactylifera* L.) fruits. *Postharvest Biol. and Technol.* 14: 207-215.