

**EXTENDING THE KHALAL STAGE OF
“ZAGHLOUL” AND “BARHI” DATES
BY UTILIZING THE MODIFIED
PACKING METHOD AND ANTI-
ETHYLENE COMPOUNDS**

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6- SUMMARY

The present study was conducted in order to increase the availability of "Zaghloul" and "Barhi" dates favored for consumption at the khalal stage. During the two successive seasons 2017 and 2018, dipping postharvest treatments and the modified packing method were applied to extend the khalal stage of "Zaghloul" and "Barhi" date palm fruits. The treatments included the control (water), the control with wood shavings, CaCl₂ (2%, w/v), glycerol (1 %, v/v), CaCl₂ plus glycerol, AVG (50 ppm), putrescine (2mM) and AVG followed by putrescine, then, the treated fruits with the substances treatments were embedded in layers of the wood shavings. All packed dates stored under cold storage conditions (4°C and 90 -95 % relative humidity).

Research objectives could be summarized as follow:

- 1- To prolong the Khalal stage of harvested mature red "Zaghloul" and yellow "Barhi" dates.
- 2- To direct the mature dates towards the formation of more natural putrescine.
- 3- To increase the opportunity of exporting more "Zaghloul" and "Barhi" dates favored for consumption at the Khalal stage.
- 4- To utilize a packaging system of dates that has already proved its efficiency in delaying the rutab formation (ripening) on a large scale.

The following points summarize the results of study:

1- The effect of treatment factor:

- 1- All treatments were able to reduce weight loss, more drastic reduction was found with the application of AVG when followed by putrescine in "Zaghloul" and "Barhi". Dates weight loss increased as the storage duration was prolonged.
- 2- Dates rutab score was reduced by CaCl₂, glycerol and AVG plus putrescine treatments in "Zaghloul" cultivar. However, AVG plus putrescine caused a significant reduction in in rutab score of "Barhi" dates. Meanwhile, extending the storage duration increased dates rutab score.

- 3- CaCl_2 , glycerol and AVG plus putrescine caused a reduction in dates decay of "Zaghloul". Moreover, the individual application of AVG or putrescine and their combination reduced decay percentage of "Barhi" dates.
- 4- Electrolyte leakage percentage reduced by AVG plus putrescine and CaCl_2 plus glycerol treatments in the two cultivars.
- 5- Total soluble solids percentage was reduced by AVG plus putrescine in "Zaghloul" dates. Meanwhile, CaCl_2 plus glycerol treatment was able to increase TSS relative to the control in "Barhi" dates. TSS was increased when the storage duration was prolonged.
- 6- There was not clear trend in "Zaghloul" dates acidity. However, AVG plus putrescine treatment increased acidity of "Barhi" dates.
- 7- The individual application of AVG or putrescine and their combination reduced vitamin C content in "Zaghloul" dates. Meanwhile, glycerol and AVG plus putrescine treatments were able to increase vitamin C in "Barhi" dates.
- 8- Total sugars content was increased in "Zaghloul" dates by CaCl_2 and AVG plus putrescine treatments. However, glycerol and putrescine treatments increased total sugars content of "Barhi" dates.
- 9- Anthocyanin content in peel of "Zaghloul" dates increased by CaCl_2 plus glycerol in the first season. However, glycerol and AVG plus putrescine treatments improved the color in the second season.
- 10- The individual application of AVG or putrescine and their combination were able to increase Carotene content in "Barhi" dates.

2- The effect of the interaction between treatment and time:

- 1- Treated "Zaghloul" and "Barhi" dates with AVG followed by putrescine after 30 days of cold storage had the best results in reduction of weight loss, decay and electrolyte leakage percentage and rutab score.
- 2- Also, AVG followed by putrescine treatment significantly reduced rutab score of "Barhi" dates after 60 days of cold storage.

- 3- The individual application of AVG, putrescine or CaCl₂ was able to reduce decay percentage in "Barhi" dates after 30 days of cold storage.
- 4- CaCl₂ plus glycerol treatment increased TSS in dates of the two cultivars after 60 days of cold storage.
- 5- Treated "Zaghloul" dates with CaCl₂ had the greatest vitamin C and total sugars content after 60 days of cold storage.
- 6- AVG followed by putrescine increased vitamin C and carotene content in "Barhi" dates after 60 days of cold storage.
- 7- Glycerol treatment was able to increase total sugars of "Barhi" dates after 60 days of cold storage.
- 8- CaCl₂ alone or along with glycerol caused the greatest anthocyanin content of "Zaghloul" dates after 30 days of cold storage in the first season. However, treated dates with AVG followed by putrescine had the highest value after 60 days of cold storage in the second season.

In conclusion this study provided evidence about the feasibility of using the combination of AVG with putrescine or CaCl₂ plus glycerol in the presence of wood shavings during cold storage to extend the khalal stage of "Zaghloul" or "Barhi" dates and maintain their quality on a large scale.