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Fructification of persimmon (*Diospyros kaki* L.f.) in Rabat-Salé area, Morocco

Z. Messaoudi¹, Y. El Moutchou*, L.D. Walali** and A. Ezzahouani**

*Ecole Nationale d'Agriculture de Meknès, BP S/40, Meknès, Morocco

**Institut Agronomique et Vétérinaire Hassan II, Rabat Instituts, Rabat, Morocco

SUMMARY – This study aimed at diagnosing fructification of persimmon (*Diospyros kaki* L.f.) cv. 'Fuyu' in the Rabat-Salé area, Morocco. Bud break onset, flowering, fruit set and fruit drop rates and fruit growth were recorded. In general, final bud break rate was low (22.3%) and seemed to be greater in the northern and southern parts of the tree canopy. Moreover, it averaged 35.2, 18.1 and 10.7% on one-, two- and three-year-old wood, respectively. Bud burst rate on each of the three different wood ages was canopy-orientation dependent. Flowering occurred between April 5 and May 17. Final flowering rate averaged 37%; it was 60.1, 46.9, 24.7 and 20.9% on the northern, southern, eastern and western direction of the tree canopy, respectively. Fruit set rate was rather low (0.7, 0.7, 3.1 and 6.7% on western, eastern, southern and northern parts of the tree, respectively) suggesting either a defective pollination or a negative consequence of an on/off yielding. Fruit growth rate was high shortly after fruit set but decreased in an irregular manner after mid-July; it varied between 0.1 and 0.4 mm/day after this later date. Final fruit diameter did not exceed 7 cm and final average yield amounted to 3.9 kg/tree. Fruit drop was very high during the two weeks that followed fruit set and low and regular thereafter up to the end of the season. Total fruit drop averaged 82%.

Key words: Persimmon, bud burst, flowering, fruit set, fruit drop, fruit growth.

RESUME – "Fructification du plaqueminier (*Diospyros kaki* L.f.) dans la région de Rabat-Salé, Maroc". Cette étude a eu pour objectif d'étudier la fructification chez le plaqueminier (*Diospyros kaki* L.f.) cv. 'Fuyu' dans la région de Rabat-Salé, Maroc. Le débourrement, la floraison et la nouaison ainsi que la croissance du fruit ont été évalués. D'une façon générale, le taux final de débourrement des bourgeons a été faible (22,3%) et paraît être grand dans le nord et le sud de la canopée. En plus, il a été estimé à 35,2, 18,1 et 10,7% respectivement sur le bois d'un, de deux et de trois ans et dépend de la direction de la canopée. La floraison a eu lieu entre le 5 Avril et le 17 Mai. Le taux final de floraison a été de l'ordre de 37%. Il est de 60,1, 46,9, 24,7 et 20,9% respectivement pour la partie nord, sud, est et ouest de la frondaison. Le taux de nouaison a été plutôt faible (0,7, 0,7, 3,1 et 6,7% respectivement dans la partie ouest, est, sud et nord de l'arbre) indiquant ainsi soit une pollinisation défectueuse ou un effet négatif de la forte charge de l'année écoulée. La vitesse de croissance du fruit a été rapide juste après la nouaison mais a diminué d'une façon irrégulière après la mi-Juillet. Elle a varié entre 0,1 et 0,4 mm/jour après cette dernière date. Le diamètre final du fruit n'a pas dépassé 7 cm et le rendement final a été de l'ordre de 3,9 kg/arbre. La chute des fruits a été importante durant les deux semaines ayant suivi la nouaison puis faible et régulière entre cette dernière date et la fin de la saison. La chute totale des fruits a été de 82%.

Mots-clés : Plaqueminier, débourrement, floraison, nouaison, chute des fruits, croissance des fruits.

Introduction

Some farmers on the Moroccan oceanic coast have recently introduced persimmon in order to diversify their production and consequently to improve their economic income. However, this new introduction was not preceded by any behavioural study of the crop under local conditions. Furthermore, some behavioural problems such as excess flower and/or fruit drop and low yields are experienced in this area. This work aimed at evaluating fructification namely bud burst, fruit set, fruit drop, fruit growth and productivity achieved in persimmon cv. 'Fuyu' under local conditions of the Rabat-Salé area where most of the national persimmon acreage is located.

Material and methods

This study was carried out during 2000 on non-astringent persimmon trees (cv. 'Fuyu') selected in

¹ Contact person: zerhoune@enameknes.ac.ma.

a commercial orchard established in 1995 at a 5 m × 2.5 m spacing and located in the Rabat-Salé area. Persimmon plants are grown using a double wire one plan trellis at a height of 60 and 100 cm, respectively. All trees were drip-irrigated starting from fruit set throughout mid-August and received conventional fertilization: 10 g/plant of ammonium nitrate (33.5%), 30 g/plant of potassium sulphate and 30 g/plant of potassium nitrate. Pruning consisted of annual renewing of fructification units and eliminating dead wood. Bud number and bud break for each of the different types of bearing wood (one-, two- and three-year-old units) and flower opening and fruit set rate were recorded. In the same way, fruit drop changes and fruit growth rate between fruit set and harvest were monitored. Yield was estimated by multiplying plant fruit number by fruit mean weight.

Results and discussion

Bud break

Bud break initiated on March 6 and lasted for four weeks. Final bud break rate was affected by the canopy orientation and the age of the bearing wood. It was low in general and averaged 22.3%. It seemed to be greater in the northern and southern parts of the canopy (Fig. 1). Moreover, the best scores were recorded on the one-year-old wood (35.2%), followed by the two-year-old wood (18.1%), then by the three-year-old wood (10.7%). Shanks (1977) reported chilling requirements of kaki are of 800 to 1000 hours <7°C while Mowat and George (1996) suggested kaki dormancy could be broken after only 100 hours <7°C. Therefore, determination of chilling requirements of persimmon under these local conditions has to be done before any new extension of this fruit crop.

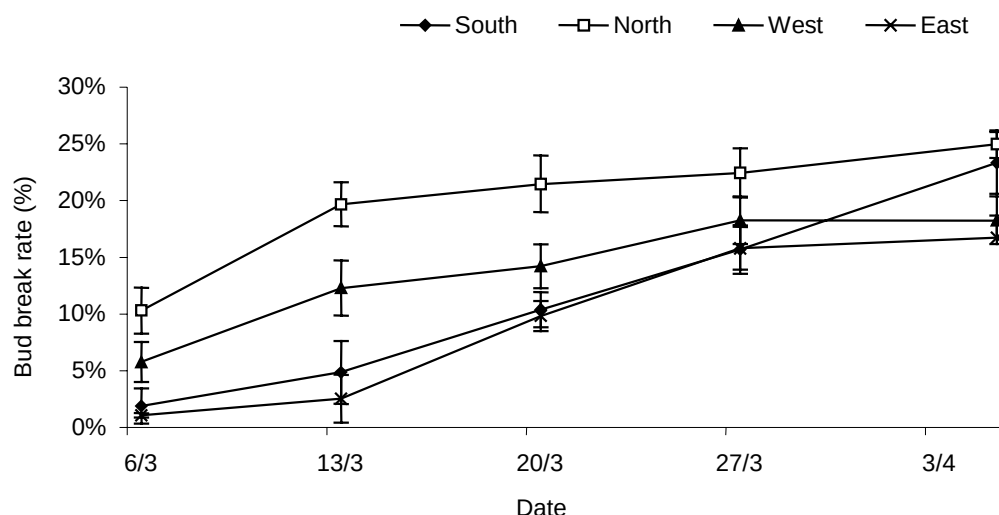


Fig. 1. Evolution of bud break by canopy direction ($\pm$ SD).

Flower opening

Flower opening lasted from April 5 to May 17 and averaged 37%. These low figures may be attributed to the substantial rain and temperature decrease experienced by the region during the period of flower opening. Yet, many of flower buds fell on the ground before their opening. Flower opening rate was direction dependent with the highest rate on the northern portion of the canopy (Fig. 2). Cumulative flowering rate was 60.1, 46.9, 24.7 and 20.9% on the northern, southern, eastern and western portions of tree canopy, respectively.

Fruit set

Fruit set rate was rather low. It oscillated between 16 and 20% from April 19 to April 26 and decreased to as low as 1% by the end of fruit set (Fig. 3).

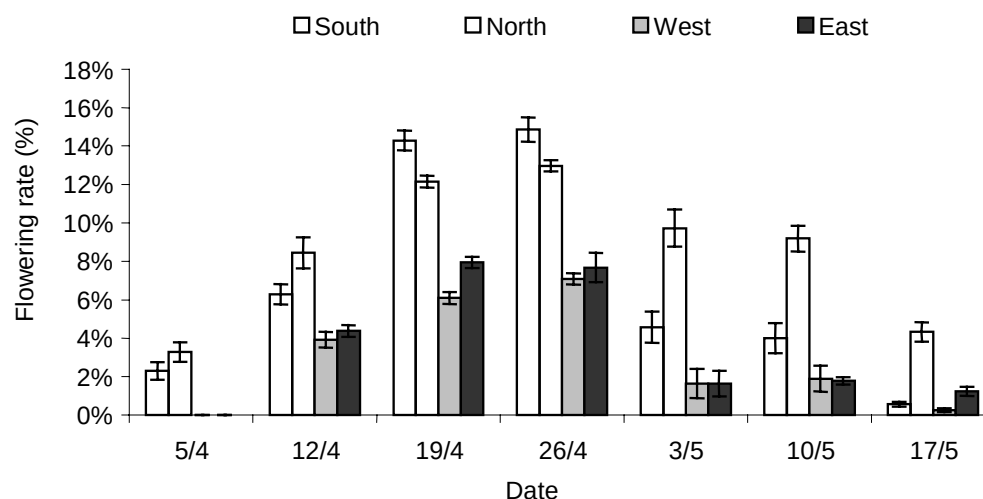


Fig. 2. Evolution of flowering rate by canopy direction ($\pm$ SD).

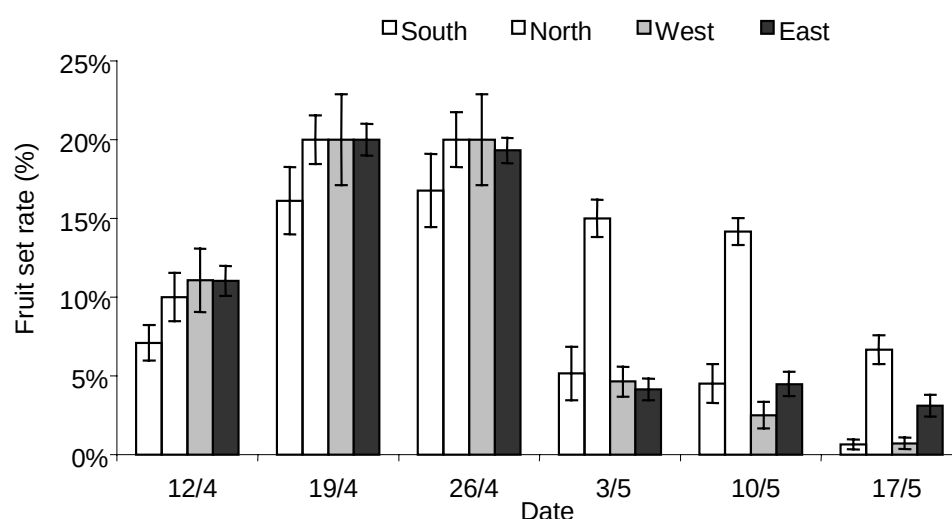


Fig. 3. Evolution of fruit set rate by canopy direction ($\pm$ SD).

Fruit set rate at this later stage averaged 6.7, 0.7, 1 and 3% for the northern, southern, western and eastern canopy direction, respectively. These low figures indicate either a defective pollination or a negative consequence of an on/off yielding. Relatively big harvests were achieved the year before and pollinizer trees are not established in a regular manner in this orchard. 'Fuyu' is a pollination constant non-astringent variety and therefore manual pollination could improve fruit set in this orchard. Yamada *et al.* (1987) noted 'Fuyu' is an alternating variety and any pollination problem would negatively affect the yield especially during the "off" year.

Fruit growth and size

Fruit growth rate was high shortly after fruit set but decreased in an irregular manner after mid-July (Fig. 4). It varied between 0.1 and 0.4 mm/day after this later date. Accordingly, fruit diameter increased almost linearly after mid-July. Final fruit diameter at harvest did not exceed 7 cm and average yield amounted to 3.9 kg/tree. The same results were reported by Sugiyama and Yamaki (1994).

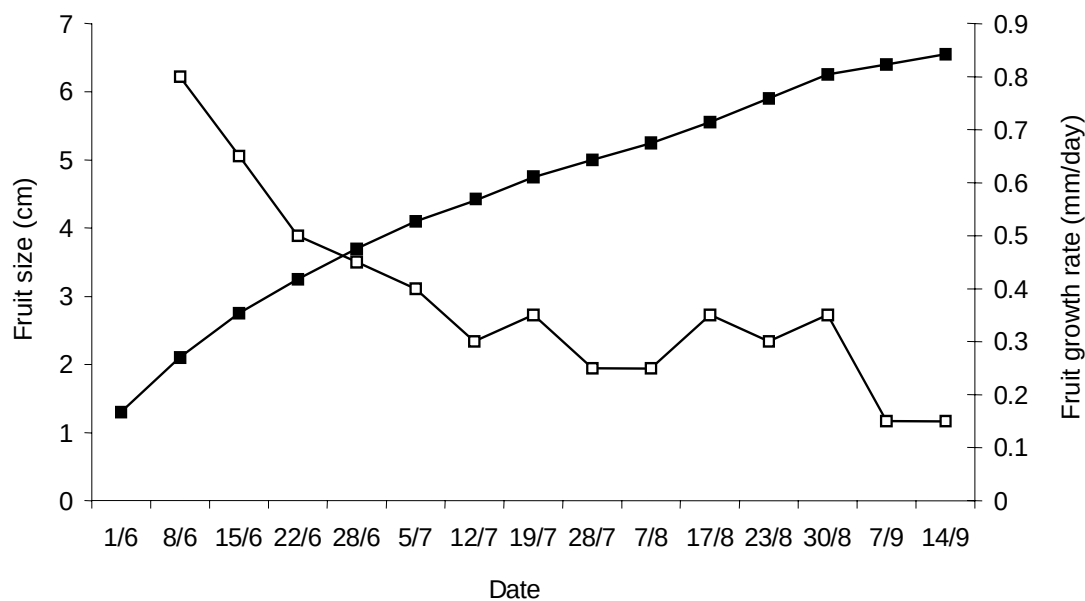


Fig. 4. Evolution of fruit growth rate (mm/day) and fruit size (cm).

Fruit drop

Fruit drop rate was very high during the two weeks that followed fruit set and low and regular thereafter up to the end of the growing season (mid-September) (Fig. 5). Final fruit drop rate averaged 82%. An incomplete pollination or a weak activity of the pollinator insect during flowering may be responsible for the high fruit abortion recorded in this orchard as reported by Itoo (1986).

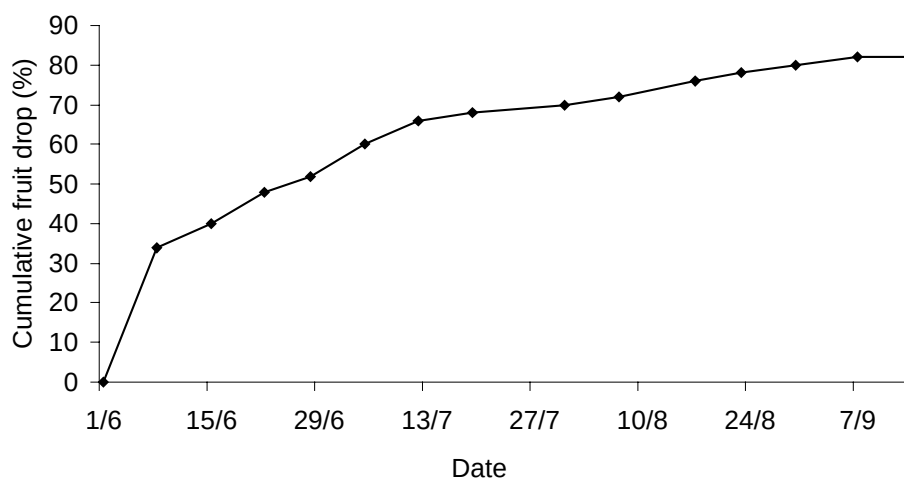


Fig. 5. Evolution of cumulative fruit drop.

Conclusion

Results obtained prove that the fructification parameters of persimmon cv. 'Fuyu', namely fruit set and yield, are low in the Rabat-Salé area. This suggests that preliminary studies have to be carried out in order to determine the suitability of this region for the cultivation of persimmon. Chilling

requirements and pollination behaviour of persimmon should be fine-tuned before making any decision to extend persimmon groves in this region. As fruit drop was excessively high after fruit set, a study to determine the effect of climate parameters, namely temperature and rain, on fruit set and growth under Moroccan conditions would be of great interest for developing this crop.

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