J. Plant Production, Mansoura Univ., Vol. 6 (8): 1451 - 1458, 2015

TIME OF DEBLOSSOMING IN RELATION TO CROPPING IN HINIDI BESINNARA MANGO TREES (*Mangifera indica L.*)

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ABSTRACT

This investigation was carried out during the seasons 2013 and 2014 on 13 years old trees of Hindi Besinnara cv. Mango trees, to evaluate the effect of deblossoming date on the early panicles of Hindi Besinnara cv. on flowering and fruiting attributes at private orchard located at Cairo – Ismailia desert road. Five dates of panicle deblossoming were used: removing all panicles of tested trees at the first week of January, removing all panicles of tested trees at the third week of January, removing all panicles of tested trees at the first week of February, removing all panicles of tested trees at the first week of February and control trees (un deblossoming trees). Results indicated that removing the early panicles at the third week of January, at the first week of February and at the third week of February increased total number of axillary panicles per tree significantly than the control. On the other hand all dates of deblossoming early panicles decreased panicles length compared to control, both of removing early panicles at the first and third week of February increased the secondary branches of panicles per panicle compared to the other treatments. Number of emerged axillary panicles per removed panicle increased with significant difference with deblossoming at the first week of February compared to the other dates of deblossoming. Removing the apical panicles of Hindi Besinnara cv. Mango trees at the first and third week of February improved significantly the perfect flowers percentage, while removing early apical panicles at the first week of February was achieved the highest percentage of fruit retention, while both of control trees and removing the early panicles at the first week of joinery decreased this percentage sharply. Moreover, removing the early apical panicles at the first week of February enhanced the Hindi Besinnara cv. fruit trees with significant difference compared to the other dates of panicles removing.

Keywords: mango-mangifera indica-deblossoming-panicles removing-flowering-yield.

INTRODUCTION

Most of mango cultivars especially Hindi Besinnara cv. suffers from low productivity due to some reasons such as early flowering Shaban (2005). Moreover low temperatures during flowering of mango have been reported to reduce hermaphrodite flowers (Whiley 1986). Panicle removing at the point of attachment was observed to induce synchronized re-flowering (Yeshitala et al 2005). Flowering date is considered to be a serious limitation of mango production. Also timing of flowering and its duration is important from commercial point of view as it determines season and duration of harvest, concepts have been developed to attribute flowering to environmental, genetic, hormonal and nutritional factors (Kulkarni 2004). Pruning by removing the panicles on March and April were applied, treatments induced flower initiation in the axillary buds (re-flowering), and more number of panicles was formed with panicles removing in March (Sasaki et al 2000).

Moreover, when mango cultivars are exposed to winter temperature to induce flowering, inflorescence development only occurs by warm temperature during winter season which causes early flowering. Whereas, the low temperature during flowering season decreases the perfect flowers percentage, number of flowers per panicle and length of panicles (whiley 1986). Warm periods during winter season may allow early flowering to occur in all mango cvs. This may be damaged by subsequent cold temperature (Litz 1997). (Sasaki et al 2000) induced axillary panicles of mango cv. Irwin by removing terminal panicles. Single de-blossoming treatments led to highly significant increase in yield compared with control trees (Singh et al 1974). Flower pruning generally delayed the time of flowering (Oosthuyse 1993). Removing inflorescences increase fruit set and maintained yield and fruit size (Jannoyer and Lauri 2009). This investigation aimed to investigate the effect of de-blossoming time of mango Hindi Besinnara cv. on lessening the early flowering phenomenon and the effect of removing early flowering on flowering and fruiting attributes.

MATERIALS AND METHODS

This investigation was conducted during two successive seasons of 2013 and 2014 on Hindi Besinnara mango cultivar trees grown in a private orchard located at Cairo – Ismailia desert road. Hindi Besinnara trees were about 13 years old, planted in sandy soil at 7x7 meters apart, grafted on seedling rootstocks, and irrigated by drip irrigation system, all investigated trees has been subjected to the horticultural practices recommended by ministry of agriculture. Trees were subjected deblossoming at four dates by removing all existing panicles. at the first week of January (T1), removing on the third week of January (T2), removing on the first week of February (T3), removing on the third week of February (T4) and control trees (no deblossoming) (T5). For each treatment has three selected trees as replicates; each selected tree has forty-five shoots were chosen randomly and tagged to determine the following flowering and fruiting attributes.

1-Number of panicles per tree was determined at full bloom (the appearing of the apical flower on the inflorescences) according to (Shaban 2005).

2-Panicle length was measured at full bloom according to (Sharma et al 2001).

3-Average number of secondary branches per panicles of 45 randomly tagged panicles for each tested tree was recorded and the average was presented according to (khattab et al., 2009).

4-Number of panicles induced for each removed panicle.

5-Perfect flowers percentage was calculated as follows
Perfect flowers % = No. of perfect flowers / total No. of flowers x 100 according to (Sharma and Room, 2006).

6-Fruit retention percentage was calculated as follows
Fruit retention % = ultimate fruit set / initial fruit set x 100.according to (Ooshthuyse, 1992).

7-Yield (Kg /tree) was estimated by multiplying the number of fruits per tree x average fruit weight at harvest according to (Crane 2004).

The data were subjected to a normal analysis of variance of the randomize complete block design (RCBD) according to (Snedecor and Cochran, 1967).

RESULTS AND DISCUSSION

Total number of panicle per tree

According to Table (1), it was clear that removing the panicle (T3) significantly increased the total number of panicle per tree compared to the other treatments in the first season, while control trees (T5) and removing at (T1) recorded the lowest total number of panicle per tree without significant difference between them. Also both treatments removing the panicles at (T2) and removing the panicle at (T4) were affected significantly in these criteria but those treatments were less than T3 significant. Moreover similar trend of results was repeated in the second season with the same sequence except that control trees (T5) which have recorded total number of panicles that was more than removing the panicle at the first week of January (T1) with significant difference. increasing of total number of panicle per tree may be related to the effect of removing the panicle on releasing apical dominance and induce buds to more lateral bud break carrying panicles more than when exposed to low temperature during winter season, these emerged panicle will appear of the low temperature which may reflect on the other flowering attributes, panicles which are exposed to low winter temperature are damaged but those emerged panicles have an ability to complete its cycle and may give a fruit at the end because of suitable temperature during its cycle. This result was in harmony with those recorded by. in this respect Oosthuyse and Jacobs (1997) reported that the increase flowering intensity by winter panicle removing could due to enhanced number of panicles developing per terminal panicle, also Sasaki et al (2000) found that removing terminal apical panicles induced the formation of axillary panicles and increase the number of panicles per tree which may increase the number of fruits per tree at the end. Moreover, Mohan et al (2001) demonstrated that pruning the apical panicles of Dashehari cv. mango trees under Indianan conditions doubled number of panicles. Shaban (2005) who reported that removing apical panicle increased significant by the number of emerged axillary panicles in Hindi Besinnara cv. Under Egyptian conditions

Panicle length (cm)

Data in table (1) showed that control trees (no panicle removal) (T5) recorded the longest panicles with significant difference compared to the other treatment. On the other hand both treatments removing the panicles at the first week of January (T1) and removing the panicle at the third week of January (T2) decreased the panicle length significantly compared to the other treatments. While removing the panicle at the first week of February (T3) and removing the panicle at the third week of February (T4) have no positive effect on panicle length and these treatments decreased panicle length significantly compared to T5 in the first season. Control trees (T5) was recorded the highest panicle length significant compared to the other treatments, on the other hand T2, T3 and T4 have no significant difference between them in this criteria, while T1 was recorded the lowest panicle length

without significant difference with T2. As shown from the previous results removing the apical panicles, decrease sharply panicles length of axillary panicles due to its effect in increasing number of panicles per tree. The effect of reducing panicles length by panicle removing may be related to the high number of axillary panicles. Moreover, decreasing panicles length with removing apical panicles may be a result of increasing number of panicles per tree. In this concern Mohan et al (2001) reported that winter pruning reduce panicle length under Indian conditions, also Shaban (2005) who reported that removing apical panicles in February decreasing axillary panicles length significantly.

Average number of secondary branches per panicle

Table (1) indicated that a significant increase detected in the average number of secondary branches per panicle when removing the panicle on the third week of February (T4) and removing the panicles on the first week of February (T3) than the control. (T5) control treatment and removing panicles on the first week of January (T1) recorded the lowest average number of secondary branches per panicle with no significant difference. While removing the panicle at the third week of January (T2) recorded average number of secondary branches per panicle which was less than T4 without significant difference. It is clear from results panicles removal increased the number panicles, the axillary emerged panicles were very chunky panicles because of high number of axillary panicle with low length of panicles due to high number of secondary branches and the decreasing of panicle length, moreover the high number of secondary branches per panicle may have an effect on increasing flowering and fruiting attributes such as fruit retention and fruit yield, also these high number of secondary branches per panicle may protect the panicles from decreasing of winter temperature.

Table (1) Effect of time of de-blossoming mango Hindi Besinnara cv. On some flowering attributes, seasons 2013 and 2014

Deblossoming dates	Total NO. Of panicles/tree		Panicle length (cm)		AV.NO. of secondary branches/panicle	
	2013	2014	2013	2014	2013	2014
T1	65.33 D	59.00 E	23.67 D	23.67 C	23.67 C	22.67 C
T2	133.0 C	135.0 C	26.00 CD	26.00 BC	29.67 B	30.00 B
T3	219.0 A	227.7 A	31.00 B	31.33 B	36.33 A	37.00 A
T4	172.7 B	166.3 B	29.33 BC	29.33 B	33.67 AB	32.00 AB
T5	73.00 D	82.67 D	37.67 A	38.67 A	23.33 C	21.33 C

*** Values shown are average and standard deviation, within each column, different letters indicate significant differences according to means of multiple LSD range tests (P < 0.05).**

Average number of emerged panicles per removal panicle

It is evident from Table (2) that removing the panicles at the first week of January (T1) decreased average number of panicles per removed panicle without significant difference compared with control trees (T5). while both removing the panicle at the third week of January (T2) and removing the panicle at the third week of February (T4) increased this number with significant difference compared to T5 and T1, but lower than those recorded by removing the panicle at the first week of February (T3). It is clear from the previous results that removing panicles during the winter season may

promote the axillary buds to give number of panicles have an ability to complete its cycle period far away of low temperature of winter season. These results were in harmony with those reported by Oosthuyse and Jacobs (1997) who reported that removing the apical panicles during winter increased the number of axillary panicles according to pruning during the winter season by removing the apical buds increase significantly flowering intensity due to enhanced number of axillary panicles developing per terminal panicles. Also Sasaki et al (2000) pointed that pruning the panicles of mango Irwin cv. during winter season increased sharply number of axillary panicles affected by winter pruning. Moreover the high increase in number of emerged panicles per removal panicle reflected on increasing of total number of panicle per tree, also increasing yield at the end. Shaban (2005) cleared that winter pruning of apical buds led to increasing emerged axillary panicles because of increasing number of panicles may be related to the effect of pruning on releasing apical dominance and inducing buds to produce axillary panicles.

Perfect flowers percentage

Data in Table (2) show clear that removing the panicle at the first week of February (T3) increased significantly percentage of perfect flowers compared with control trees (T5) and removing the panicles on the first week of January (T1) but without significant difference with both removing the panicle on the third week of January (T2) and removing the panicle at the third week of February (T4) in the first season. On the other hand T1 and T5 were recorded the lowest perfect flowers percentage. The low temperature during formed of flowers has an effect on sex expiration according to Singh et al (1974), also panicles of T5 and T1 subjected to low temperature during its formed which may lead to decrease perfect flowers percentage, on the other hand panicles of T3, T2 and T4 formed after low temperature periods of winter which may reflect on increasing perfect flowers percentage. Also this effect of removing early panicle on sex ratio depends on flowering time. The early cultivars have a positive relation with removing early panicles on sex ratio as detected by Kumar and Reddy (2006) who reported that mango cultivars such as Baneshan and Mallika which subjected to pruning panicles responded to removing the early flowering positively, on the other hand mango cultivars such as Totapuri, Chinna Rasam and Himayuddin have a poor responded to panicle pruning during winter season because these cultivars are late mango cultivars which reflect on delaying flowering time which reflect on the ability of these cultivars on far away of low temperature of winter season. Moreover Sharma and Room (2006) confirmed that late mango cultivars did not affected by winter panicles pruning on perfect flowers percentage. In general the high perfect flowers percentage due to high fruit set and high fruit retention percentage which reflect on increase fruit yield.

Fruit retention percentage

Data in Table (2) proved that removing the panicle at the first week of February (T3) and removing the panicle at the third week of February (T4) recorded the highest percentage of fruit retention in the first season with significant difference compared to the other treatments. While removing the panicle at the third week of January (T2) increased significantly percentage of

fruit retention compared to control trees (T5) and removing the panicles at the first week of January (T1) but less significantly than both of T3 and T4. In the second season only T3 was recorded the highest significantly percentage of fruit retention compared with the other treatments, on the other hand T1 recorded the lowest fruit retention percentage in the first season, while T2, T4 and T5 increased fruit retention percentage significantly compared with T1 but less significant extant than T3. As the reflection of perfect flowers percentage T2, T3 and T4 recorded the highest perfect flowers percentage which led to increase fruit retention percentage. These results were in harmony with those recorded by Oosthuyse (1992) who reported that winter pruning by removing the apical panicles increased fruit retention of axillary panicles. This increasing in fruit retention percentage was showed with removing the early flowering of early mango cultivars because of an its increasing in perfect flowers due to a warm temperature during flowers formation, while control trees panicles subjected to low temperature had a decrease percentage of perfect flowers so a decrease fruit retention percentage was detected .

Table (2) Effect of de-blossoming time of mango Hindi Besinnara cv. On average number of panicles per removal panicle, perfect flowers percentage, fruit retention percentage and tree fruit yield (Kg/tree), seasons 2013 and 2014

Deblossoming dates	AV.NO.of emerged panicles/removal panicle		Perfect flowers%		Fruit retention %		Yield (Kg/tree)	
	2013	2014	2013	2014	2013	2014	2013	2014
T1	0.877 C	0.757 D	15.87 B	15.63 C	0.347 C	0.543 E	12.97 C	14.53 D
T2	1.667 B	1.467 BC	16.83 AB	17.23 AB	0.740 B	0.907 C	22.30 B	23.27 C
T3	2.600 A	2.800 A	17.63 A	17.93 A	1.460 A	1.663 A	32.50 A	34.60 A
T4	1.967 B	2.000 B	16.93 AB	17.27 AB	1.327 A	1.393 B	26.47 AB	28.03 B
T5	1.000 C	1.000 CD	16.40 B	16.60 BC	0.510 C	0.687 D	19.03 BC	17.73 D

*** Values shown are average and standard deviation, within each column, different letters indicate significant differences according to means of multiple LSD range tests (P < 0.05).**

Yield tree (Kg/tree)

Data presented in Table (2) reveal that removing the panicles on the first week of January (T1) in the first season resulted in the lowest tree fruit yield with significant difference compare than the other treatments. On the other hand removing the panicle on the first week of February (T3) recorded the highest yield tree significantly compared with the other treatments except removing the panicle on the third week of February (T4) with no significant difference from T3, on the other hand both removing the panicles on the first week of January (T1) and control trees (T5) recorded the lowest tree fruit yield with significant difference compared to T2, T3 and T4. Increasing in total number of panicles per tree, due to increasing in emerged panicles per removal panicle and increase fruit attributes such as perfect flowers percentage and fruit retention percentage lead to increase tree fruit yield compared to control trees which gave a low tree yield due to the low total number of panicles per tree, perfect flowers percentage and fruit retention percentage. These results are in line with those recorded by Gross (1996) found that different panicles pruning treatments increase mango yield. Mohan

et al (2001) who found that removing the early panicles of Dashehari mango cultivar increase sharply tree fruit yield. Moreover Shinde et al (2002) found that deblossoming of mango cv. Alphonso recorded the highest fruit number per tree at harvest. Also Yeshitela et al (2003) reported that panicles removal at the point of apical dud could produce superior yield than control trees of Keitt cv. with significant difference. Crane (2004) stimulated fruit production of mango by using panicle removal. Furthermore Shaban (2005) pointed out that winter pruning by removing the apical buds increase tree fruit yield comparing to the control trees.

CONCLUSION

It could be concluded that removing the early panicle of mango cv. Hindi Besinnara on the first week of February is a very promising treatment for overcoming early flowering phenomenon to increase number of axillary panicles which with an increasing percentage of perfect flowers leading to better ability of fruit retention and yield which reflect on improve Hindi Besinnara yield fruit tree.

REFERENCES

Carne, J.H. (2004). Selected cultural techniques to improve production of some subtropical and tropical fruit crops. Acta Hort. 632:179-187.

Gross, E.R.(1996). Pruning mango to increase yield. Acta Hort. 455: 538-542.

Jannoyer, M. and P.E. Lauri (2009). Removal of mango inflorescences increase fruit set and dose not affect yield (mangifera indica cv. Cogshall). Acta hortic. 820, 433-436.

Kattab M.M.; G.M. Haseeb and M.A. Elkhishen (2009).The effect of post harvest pruning, GA3 and Ethrel concentrations on some flowering attributes and yield of some mango cultivars.Bul.Fac.Agric.Cairo univ.60:306-314.

Kulkarni, V.J. (2004). The tri-factor hypothesis of flowering in mango. Acta Hortic. 645, 61-70.

Kumar, M.A. and Y.N. Reddy (2006). Effect of pruning on sex ratio, fruit set, retention of fruits and fruit quality in certain varieties of mango (Mangifera Indica). Journal of Research ANGRAU. 34: 22-25.

Litz, R.E. (1997). The mango botany, production and uses. First ed., pp.238-244 CAB international New York U.S.A.

Mohan, S.; R. Sant; C.P. Singh and P. Shukla (2001). Effect of pruning on growth, flowering and fruiting in mango. Indian Journal of Horticulture. 58(4): 303-308.

Oosthuyse, S.A. and G. Jacobs (1997). flowering synchronization of Sensation mango trees by winter pruning. Acta Hort. 455, 422-430.

Oosthuyse, S.A.(1992). Ideas on pruning of mango trees. S. Afri. Mango Growers Assn. Yrbk.12:1-7.

Oosthuyse, S.A.(1993). Evaluation of winter pruning to synchronize the flowering of Sensation mango trees. South Africa mango growers ASSOC. Yearbook. 13:54-57.

Sasaki,K. Lnoue, H.and N. Utsunomiya (2000). Floral induction in axillary buds affected by pruning at panicle emergence in mango trees cv. Irwin growing in plastic house in Japan. Acta. Horti. 509,301-306.

Shaban, A.E.A.(2005). Effect of pruning on growth, flowering and fruiting of Hindi Bisinnara mango trees. Journal of agriculture science, Mansoura univ., 30 (3):1541-1551.

Sharma, R.R. and S. Room (2006). Pruning intensity modifies canopy microclimate, and influences sex ratio, malformation incidence and development of fruited panicles in Amrapil mango (mangifera indica L.). Scientia horticulture. 109:118-122.

Sharma, R.R.; C.N. Singh; S.K. Saxena; S.N. Pandey and O.P. Chonkar, (2001). Cluster planting favours malformation and influences yield and fruit quality in mango. Ann. Agri. Res. 22:48-51.

Shinde, A.K.; G.M. Waghmare; S.K.Godse and B.P. Patil (2002). Pruning for rejuvenation of overcrowded old mango. Indian Journal of Agricultural Sciences. 72(2): 90-92.

Singh, R.N.; P.K.Majumdar; D.K.Sharma; G.C. Sinha and P.C. Bose (1974). Effect of deblossoming on the productivity of mango. Scientia Hort. 2: 399-401.

Singh, R.N.; P.K. Majunder; D.K.Sharma; G.C.Sinha and P.C.Bose (1974). Effect of de-blossoming on the productivity of mango. Scientia Horticulture. (2): 399-403.

Snedecor, G.W. and W.G. Cochran (1967). Statistical methods. 6th Ed., lowa state Univ. press, Ames, Iowa, USA.

Whiley,A.W.(1986). Crop management review. Proc. 1st Australian mango research workshop. CSIRO. Australia. Melbourne. P. 186-95.

Yeshitela, T.; P.J.Robbertse and P.J.C. Stassen (2003). The impact of panicles and shoots pruning on inflorescence and yield related developments in some mango cultivars. J. APPL. Hort. 5(2):69-75.

Yeshitela, t.;P.J.Robber and P.J.C.Stassen (2005). Effects of pruning on flowering, yield and fruit quality in mango. Australian journal of experimental agriculture: 45(10)1325-1330.

موعد ازالة النورات و علاقته بالمحصول فى اشجار المانجو صنف الهندى بسنارة

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أجريت هذه التجربة خلال موسمين متعاقبين ٢٠١٣ و ٢٠١٤ على أشجار المانجو صنف الهندى بسنارة عمر ١٣ سنة منزرعة بطريق مصر- اسماعيلية الصحراوى لدراسة تاثير ازالة النورات الطرفية المبكرة على الصفات الزهرية والثمرية لصنف المانجو الهندى بسنارة ويمكن تلخيص النتائج فيما يلى: تم ازالة النورات المبكرة لاشجار المانجو صنف الهندى بسنارة فى خمس مواعيد مختلفة وهى ازالة النورات الطرفية المبكرة فى الاسبوع الاول من يناير و ازالة النورات الطرفية المبكرة فى الاسبوع الثالث من يناير و ازالة النورات الطرفية المبكرة فى الاسبوع الاول من فبراير و ازالة النورات الطرفية المبكرة فى الاسبوع الثالث من فبراير والاشجار الغير معاملة (أشجار المقارنة) . وقد اشارت النتائج لان ازالة النورات الطرفية المبكرة فى الاسبوع الثالث من شهر يناير والاسبوع الاول من فبراير قد ذادت وبشكل معنوى من العدد الكلى للنورات الجانبية الى الشجرة بالمقارنة باشجار الكنترول. على الجانب الاخر فان اشجار الكنترول اظهرت افضل النتائج وبشكل معنوى من حيث طول النورات بالمقارنة ببقية مواعيد ازالة النورات الطرفية المبكرة. كل من ازالة النورات الطرفية المبكرة فى الاسبوع الاول والثالث من شهر فبراير قد ذادت وبشكل معنوى من عدد الافرع الثانوية الى النورة مقارنة باشجار الكنترول. عدد النورات الجانبية التى ظهرت الى النورة المزالة قد زاد بشكل معنوى مع ازالة النورات الطرفية المبكرة فى الاسبوع الاول من شهر فبراير مقارنة بازالة النورات الطرفية المبكرة فى اى وقت اخر. تزالة النورات الطرفية المبكرة فى الاسبوع الاول والثالث من شهر فبراير زادت بشكل معنوى من النسبة الجنسية للازهار مقارنة باشجار الكنترول. ازالة النورات المبكرة فى الاسبوع الاول من شهر فبراير زاد بشكل معنوى من النسبة المئوية للثمار المتبقية مقارنة ببقية المواعيد وايضا اشجار الكنترول. بالاضافة لذلك فان ازالة النورات المبكرة قد حسن وبشكل معنوى ملحوظ من محصول الشجرة مقارنة باشجار الكنترول.

الكلمات الدالة: مانجو – ازالة النورات المبكرة – التزهير - الاثمار