Biological Forum – An International Journal **14(3): 1702-1706(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Enhancing Cropping by Agro Chemicals Spraying of Kuliana Local

Sarada P.[1*], Sahoo A.K.[2] Sahoo S.C.[3], Das S.N.[1], Panda R.K.[4] and Dash A.[5]

[1]Department of Fruit Science and Horticulture Technology, OUAT, Bhubaneswar (Odisha), India.
[2]All India Coordinated Research Projects on Palms, OUAT, Bhubaneswar (Odisha), India.
[3]Department of Fruit Science and Horticulture Technology, OUAT, Bhubaneswar (Odisha), India.
[4]Department of Plant Physiology, College of Agriculture, OUAT, Bhubaneswar (Odisha), India.
[5]Department of Agriculture statistics, College of Agriculture, OUAT, Bhubaneswar (Odisha), India.

(Corresponding author: Sarada P.)*
(Received 03 May 2022, Accepted 13 July, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: The present investigation entitled "Effect of plant growth regulators on flowering, fruit set, yield of acid lime (*Citrus aurantifolia* Swingle) Kuliana local". This research was conducted at Horticultural Research Station, Department of Fruit Science and Horticultural Technology, Orissa University of Agriculture and Technology, Bhubaneswar, during 2019- 2020 and 2020-21 to evaluate the suitable growth regulator in terms of fruit yield and yield attribute parameters. Results showed that application of growth regulators like 2,4-D (2,4-D at 10 ppm and 20 ppm), GA_3 (GA_3 at 50 ppm and 100 ppm), NAA (NAA at 100 ppm and 200 ppm), SA (SA at 100 ppm and 200 ppm), Spermidine (Spermidine at 0.01 ppm and 0.5 ppm), Putrescine (Putrescine at 0.01 ppm and 0.5 ppm), Brassinosteroid (Brassinosteroids at 0.1 ppm and 0.5 ppm) and control on yield attributes of acid lime kulianalocal. The yield and yield attributing observations on various yield attributes were recorded in same seasons in both years. The best growth regulator for fruit yield has determined on the basis of growth regulators performances as growth regulators variation has tremendous effect for yield of fruit. Brassinosteroids showed the best effect for number of flowers per shoot (20.17), Fruit set (93.68 per cent), Fruit retention (25.94 per cent), Fruit drop (74.06 per cent), number of fruits per tree (490.36), Kg/tree (16.26), fruit weight (33.11 gm), fruit length (5.06 cm), fruit diameter (4.36 cm) with the other treatments including the untreated fruits in both seasons of the study. Our results illustrated that the BR was gave best results in yield attributes for Kuliana lime.

Keywords: Agrochemicals, foliar application, yield attributes, fruit set, fruit drop.

INTRODUCTION

Acid lime (*C.aurantifolia* swingle) belongs to the family Rutaceae originated in India and then spread to the middle east and other tropical and subtropical countries. Sweet orange, mandarin and grapefruit were sub-tropical, whereas lime and lemon were tropical in their climatic requirements (Devi *et al*., 2011). Acid lime fruits are economically important with a large-scale production of both the fresh and processed products. In India, acid lime fruits are cultivated in an area of 322 thousand hectare with a production of 3517 thousand MT (NHB 2021-22). Numerous cultivars of acid lime are cultivated in India with diversity in flavour and taste. Kuliana lime is a local elite land race of Mayurbhanj district of Odisha. In most citrus species, heavy fruit drop and occasional low fruit set are serious problems. The continued fruit drop at various stages of fruit development results in yield and leads to low profit to citrus growers. This land race has difficulty in flowering, fruiting and fruit set resulting in reduction in yield. The use of plant growth regulators to enhance fruit set and fruit size has become important in horticulture today as they have the ability to increase fruit set percentage, yield and fruit quality. Plant growth regulators can be grouped in two categories based to how long they are being used significantly in horticulture. They are some plant growth regulators which are well harnessed and used widely by farmers. These include Auxins Gibberellins, Cytokinins, Ethylene and ABA. Apart from these growth regulators whose efficacy and efficiency are known to us.But due to technological gap they are not yet been harnssed at grass root level. These includes Brassinosteroids, Polyamines, Salicylic acid etc. Hence the experiment entitled "Influence of plant growth regulators on flowering, fruit set, yield of acid lime Kulina Local".

MATERIAL AND METHODS

Research was conducted at the Horticultural Research Station, Department of Fruit Science and Horticulture Technology, College of Agriculture, OUAT, Bhubaneswar, during the period of September 2019 to July 2021. The experiment was laid out in Randomized Block Design (RBD) in fifteen treatments with three replications having three plants in each replication had been epitomized when applied at preflowering, at the time of flowering, fruit set stage.The experimental site is under 18th agro climatic region of the country (Eastern Coastal Plain) and termed as sub humid. The climate of which is warm, humid with distinct summer, rainy and winter seasons. The present experiment was conducted in "on line OPSTAT Pooled RBD ANOVA". The diameter and length of fruit was measured with vernier caliper. Weight of fruit (g) was recorded by electrical balance. Fifty freshly opened hermaphrodite flowers were tagged randomly in each plant. After seven day, the numbers of fruit set was recorded and converted to percentage. The numbers of fruit which reach maturity were recorded and fruit retention percentage was calculated. Fruits of each tree in spring season were counted at each harvesting and presented as number of fruit/ tree . Soon after fruit set ten fruits of each replication were tagged and the average time taken for maturity was determined. At each picking, the weight of the harvested fruits from each tree was recorded separately and yield per tree (kg) was calculated.

RESULT AND DISCUSSION

A. Number of flowers per shoot

Number of flowers per shoot was significantly influenced by different levels of plant growth regulators. From the pooled data, Table 1, it was observed that the maximum number of flowers per shoot (20.17) was recorded in the treatment T_{14} (0.5 ppm BR) followed by (19.33) the treatment T_{13} (0.1 ppm BR) and the minimum number of flowers per shoot (13.83) was recorded in T_{15} (control) during the period 2019-21. It might be due to BR's may coordinate with light signaling in the control of the floral transition. The increase in number of flowers per shoot, might be due to plants remain physiologically more active to build up sufficient food stock for developing flowers and fruit production, ultimately resulted into flower set. The above results were in agreement with those of Chaudhari *et al*. (2016); Mahokar *et al*. (2018) in custard apple and Kacha *et al*. (2012) in phalsa and probably due to Brassinosteroid enhanced expression activity and protein stabilty which is blue light dependent. Brassinosteroid may coordinate with light signaling integrates in the control of the floral transition.BR signaling integrates with environmental cues to fine tune the time of flowering through the flowering pathway and it is also found that BR's are also critical for floral transition, inflorescence, elongation of stigma, stem architecture formation and other aspects of plant reproductive process (Zicong Li and Yuehui He 2020). These results were confirmed with these reported by Yamini (2020) in acid lime.

B. Fruit set

Fruit set is the critical phase in the transformation of a flower to a fruit to obtain good yield and to increase a grower's returns**.** Fruit set was counted on marked branches following bloom and petal fall. There were significant differences in fruit set percentage among the various PGR treatments. Fruit set per panicle at pea stage was significantly influenced by different levels of plant growth regulators after two months of flowering. From the pooled data, Table 1, it was observed that the maximum fruit set per panicle at pea stage (93.68 %) was recorded in the treatment T_{14} (0.5 ppm BR) which was followed by (93.32 %) the treatment T_{13} (0.1 ppm BR) and the minimum fruit set per panicle at pea stage (84.87 %) was recorded in T_{15} (control) during the period 2019-21. These results are in agreement with these reported by Sotomayor *et al*. (2012) with Caramel almond (*Prunus dulcis*) trees. They reported that foliar application of brassinosteroid achieved increase in fruit set in comparison to the control. The present results agreed with these reported by El-Boray *et al*. (2015) in sweet orange.

C. Fruit retention

The pooled Table 1 revealed that fruits retention at pea stage during the course of investigation was found to be very significant in both the years. It was observed that treatment T_{14} bearing the chemical application of 0.5 ppm BR was recorded to be the maximum fruit retention per panicle at pea stage (25.94 %) in acid lime cv. Kuliana, which was on par with the treatment T_{13} (0.1 ppm BR) (25.89 %). Whereas, minimum fruit retention per panicle at pea stage (21.84 %) was recorded in T_{15} (control) during the period 2019- 2021. These results are in agreement with these reported by Sotomayor *et al*. (2012) with Caramel almond (*Prunus dulcis*) trees. They reported that foliar application of brassinosteroid achieved increase in fruit retention in comparison to the control. The present results agreed with these reported by El-Boray *et al*. (2015) in sweet orange.

D. Fruit drop

Pre-harvest drop of the fruit is of commercial loss to farmer as the drop occurs just before harvesting when fruit is physiologically mature. Percentage of fruit drop was significantly reduced and delaying the maturity was done by the application of different concentrations of plant bio-regulators. After initial set a large number of fruits drop takes place due to various reasons viz., due to lack of pollination, prevalence of self and cross incompatibility, environmental condition and endogenous hormonal level etc. The data revealed for fruits drop per tree as influenced by different spray of plant growth regulators i.e2,4-D, GA_3, NAA, salicylic acid, spermidine, putrescine and brassinosteroids are presented in pooled Table 2 During both years (2019-20 and 2020-21), lowest fruit drop (74.06 %) was observed in controlled one, which was decreased significantly by different treatments Table 2. In both the years, minimum fruit drop per cent was recorded in the treatment 0.5 ppm BR (74.06 %) which was on par with T_{13} (74.11 %). whereas highest fruit drop percent (78.16 %) was recorded in the treatment T_{15} (control). It might have increased photosynthesis efficiency of lime trees and resulted in to increased synthesis of photoassimilates and CHO, which mobilized in fruits. Also, stresses might have reduced, resulted in reduced fruit drop and increased number of fruits. These results are in agreement with these reported by Sotomayor *et al*. (2012) with Caramel almond (*Prunus dulcis*) trees. They reported that foliar application of brassinosterioid achieved increase in fruit set in comparison to the control. The present results agreed with these reported by El-Boray *et al*. (2015) in sweet orange.

E. Number of fruits per tree

From the pooled data presented in the Table 2, It was found that significant variation was recorded among the treatments. Highest number of fruits per tree was recorded in T_{14} (0.5 ppm Brassinosteroid) i.e., (490.36) which was followed by T_{13} (0.1 ppm Brassinosteroid) (470.82). The minimum yield was recorded inT_1(control) (257.72). The increase in number of fruits/tree might be due to increased photosynthetic activity in leaves and translocation of more photoassimilation. It might be due to better accumulation of photosynthesis in treated plants. Similar findings were also observed by Kumar *et al*. (2012) in strawberry. Sugiyama and Kuraishi (1989) noted that spraying of 0.1 ppm Brassinolide at anthesis and two months after anthesis in Morita Navel orange trees increased fruit set indicating importance of application stage. The present findings are also agreement with those reported Gomes *et al*. (2006) in yellow passion fruit highest yield up to 65% more than average yield due to the more number of fruit set. Similarly, increased yield was also observed in Navel orange and sweet cherry (Roghabadi and Pakkish 2014). Brassinosteroids also confer resistance to plants against biotic abiotic stresses (Khripach *et al*., 1999). Many biotic and abiotic factors influence the physiological processes from opening to flower to fertilization and fruit set.

F. Kg/tree

From the pooled data presented in the Table 2, It was found that significant variation was recorded among the treatments T_{14} (0.5 ppm BR) (16.26) which was followed by the treatments T_{13} (0.1 ppm BR) (15.51). The minimum yield was recorded inT_1 (control) (7.13). It might be due to attributed to better fruit size and better vegetative growth. The increase in the yield might be due to the increased number of fruits per plant which directly corresponds to the increased fruit set. The results are in agreement with the findings reported by Kulkarni *et al.* (1996); Patel *et al.* (2010) in custard apple. The increase in number of fruits per tree might be due to increased photosynthetic activity in leaves and translocation of more photoassimilates. Similar findings were also observed by Bhat *et al*. (2011) in strawberry.

G. Fruit weight

The pooled Table 3, divulged that growth regulators played significant role in improving weight of acid lime fruit. Among the different treatments used for study, T_{14} (0.5 ppm BR was found more effective in increasing the fruit weight. During the period 2019-2021, the maximum fruit weight (33.11 g) was recorded in the treatment T_{14} (0.5 ppm BR) which was followed by the treatment T_{13} (0.1 ppm BR) (32.87 g). Whereas, the minimum fruit weight was (27.62 g) recorded in T_{15} (control). BR 0.5 ppm gave highest fruit weight due to the increased assimilation efficiency of photosynthetic carbon, however BR, stimulate greater CO_2 assimilation and increased cell division. Fruit weight in sweet cherries increased after using brassinosteroids. Fruit weight in sweet cherries increased after the use of brassinosteroids. According to Baghet *et al*. (2019); Eid *et al*. (2015), milagrow (0.2% BR) applied topically to avocado tree cv. Furete boosted the weight of the fruit. Bhat *et al*. (2011) noted that BR 0.4 mg/L gave the largest bunch and berry weight due to the enhanced efficiency of photosynthetic carbon assimilation; however, BR stimulated more carbon dioxide assimilation and increased cell division.

H. Fruit length

Statistical variation was observed among different treatments in both the years with respect to fruit length as appeared in pooled Table 3. Among the different treatments, the maximum fruit length (5.06 mm) was recorded in the treatment T_{14} (0.5 ppm BR) which was followed by T_{13} (0.1 ppm BR) (5.03 mm). Whereas, the minimum fruit length was (4.53 mm) recorded in T_{15} (control). Similar findings were observed by El-Boray *et al*. (2015) in Washington navel orange.

I. Fruit diameter

From the pooled data Table 3, it was found that the maximum fruit diameter (4.36 mm) was recorded in the treatment T_{14} (0.5 ppm BR) which was on par with the treatment T_{13} (0.1 ppm BR) (4.35 mm) and the minimum fruit diameter (4.04 mm) was recorded in the treatment T_{15} (control). Similar findings were observed by El-Boray *et al*. (2015) in Washington navel orange.

CONCLUSIONS

It is concluded on the basis of overall performance of treatments on yield characters of fruits, it can be concluded that the values for the number of flowers per shoot, number of fruit set, fruit retention and decreased fruit drop percent, maximum number of fruits per tree, Kg per tree, fruit weight, length, diameter have been obtained maximum while the minimum fruit drop was recorded with BR @ 0.5 ppm of acid lime during both seasons.

FUTURE SCOPE

The great potential of BS, they can be exploited in vegetables to enhance their production. Since BR's are also known for their role in protection of plants from different stress situations including biotic stress such as the attack of different pathogens. Therefore, the can easily and efficiently replace different pesticides and fungicides which otherwise have health hazards and also degrade environment. The role of polyamines has been studied by different scientists to solve Horticulture issues but still a lot of research is needed to understand the proper phenomenon of the action of polyamines.

Table 1: Effect of plant growth regulators on number of flowers per shoot, fruit set and fruit retention percentage of acid lime (*Citrus aurantifila* Swingle) Kuliana local.

	Number of flowers per shoot			Fruit set (%)			Fruit retention (%)		
	1st season	2nd season	Pooled	1st season	2nd season	Pooled	1st season	2nd season	Pooled
T_1	12.33	14.33	13.33	85.10 (67.29)	89.05 (70.68)	87.07 (68.93)	22.80 (28.52)	23.27 (28.84)	23.04(28.69)
T_2	13.67	16.33	15.00	85.81 (67.87)	89.44 (71.04)	87.63 (69.41)	22.90 (28.59)	23.68 (29.12)	23.29 (28.86)
T_3	13.67	17.33	15.50	86.05 (68.07)	91.16 (72.70)	88.60 (70.27)	23.29 (28.86)	24.79 (29.86)	24.04 (29.36)
T_4	14.00	17.67	15.83	86.91 (68.79)	91.89 (73.45)	89.40 (71.00)	23.70 (29.13)	24.93 (29.95)	24.31 (29.54)
T_5	13.00	17.00	15.00	86.55 (68.49)	90.04 (71.60)	88.30 (70.00)	23.13 (28.75)	23.88 (29.25)	23.50 (29.00)
T_6	13.67	17.00	15.33	86.91 (68.79)	90.37 (71.92)	88.64 (70.30)	23.24 (28.82)	24.37 (29.58)	23.80 (29.20)
T_7	14.00	18.00	16.00	88.39 (70.08)	92.09 (73.67)	90.24 (71.80)	23.74 (29.16)	25.15 (30.10)	23.44 (28.96)
T_8	14.33	19.00	16.67	88.90 (70.54)	92.89 (74.54)	90.90 (72.44)	24.25 (29.50)	25.39 (30.26)	24.82 (29.88)
T_9	15.33	19.33	17.33	89.18 (71.80)	93.50 (75.23)	91.34 (72.89)	24.57 (29.71)	25.67 (30.44)	25.12 (30.08)
T_{10}	16.00	19.33	17.67	89.83 (71.40)	93.92 (75.72)	91.88 (73.44)	24.62 (29.75)	25.87 (30.57)	25.25 (30.17)
T_{11}	15.67	19.67	17.67	90.92 (72.46)	94.10 (75.94)	92.51 (74.12)	25.11 (30.07)	26.16 (30.76)	25.64(30.42)
T_{12}	16.33	20.33	18.33	91.09 (72.63)	94.73 (76.73)	92.91 (74.56)	25.26 (30.17)	26.36 (30.89)	25.81(30.53)
T_{13}	17.33	21.33	19.33	91.20 (73.74)	95.44 (77.67)	93.32 (75.02)	25.42 (30.28)	26.36 (30.89)	25.89 (30.59)
T_{14}	18.67	21.67	**20.17**	91.50 (73.05)	95.85 (78.25)	**93.68 (75.44)**	25.41 (30.27)	26.47 (30.96)	**25.94 (30.62)**
T_{15}	12.67	15.00	**13.83**	83.78 (66.25)	85.95 (67.99)	**84.87 (67.11)**	21.24 (27.44)	22.44 (28.28)	**21.84 (27.86)**
Mean	14.71	18.23	16.47	88.15	92.02	90.08	23.91	24.98	24.38
SEm(±)	1.88	1.93	1.95	0.27	0.31	0.29	0.36	0.27	0.31
CD @ (5%)	0.64	0.66	0.66	0.09	0.11	0.10	0.125	0.094	0.111

Table 2: Effect of plant growth regulators on fruit drop, number of fruits per tree and yield (Kg/tree) of acid lime (*Citrus aurantifila* Swingle) Kuliana local.

Treatment	Fruit drop (%)			Number of fruits per tree			Yield (Kg /tree)		
	1st season	2nd season	Pooled	1st season	2nd season	Pooled	1st season	2nd season	Pooled
T_1	77.20 (61.48)	76.73 (56.38)	76.97 (61.32)	239.29	297.04	268.17	6.94	8.66	7.80
T_2	77.10 (61.41)	76.32 (56.33)	76.71 (61.14)	268.63	345.98	307.31	7.83	10.20	9.01
T_3	76.71 (61.14)	75.21 (56.12)	75.96 (60.64)	273.48	392.68	333.08	8.14	12.20	10.17
T_4	76.30 (60.87)	75.07 (55.91)	75.69 (60.46)	288.27	404.67	346.47	8.63	12.65	10.64
T_5	76.87 (61.25)	76.12 (56.20)	76.50 (61.00)	260.33	365.55	312.94	7.63	10.84	9.24
T_6	76.76 (61.18)	75.63 (56.15)	76.20 (60.80)	275.86	374.35	325.11	8.18	11.19	9.68
T_7	76.26 (60.84)	74.85 (55.89)	75.56 (60.37)	293.72	416.91	355.31	8.91	13.12	11.02
T_8	75.75 (60.50)	74.61 (55.63)	75.18 (60.12)	308.25	448.11	378.18	9.45	14.30	11.87
T_9	75.43 (60.29)	74.33 (55.46)	74.88 (59.92)	336.00	464.16	400.08	10.40	14.95	12.68
T_{10}	75.38 (60.25)	74.13 (55.44)	74.75 (59.83)	353.89	469.84	411.86	11.02	15.29	13.16
T_{11}	74.89 (59.93)	73.84 (55.19)	74.37 (59.58)	357.73	484.10	420.91	11.22	15.91	13.57
T_{12}	74.74 (59.83)	73.64 (55.12)	74.19 (59.47)	375.74	507.91	441.82	11.91	16.84	14.37
T_{13}	74.58 (59.72)	73.64 (55.03)	74.11 (59.41)	401.72	539.11	470.82	12.93	18.09	15.51
T_{14}	74.59 (59.73)	73.53 (55.04)	**74.06 (59.38)**	433.46	547.26	**490.36**	14.12	18.40	**16.26**
T_{15}	78.76 (62.56)	77.56 (57.20)	**78.16 (62.14)**	225.21	289.84	**257.52**	6.12	8.14	**7.13**
Mean	76.08	75.01	75.55	314.78	423.17	367.99	9.56	13.38	11.47
SEm(±)	0.36	0.29	0.32	38.69	46.66	43.37	1.17	1.51	1.33
C.D. (5%)	0.12	0.09	0.11	13.358	16.109	14.797	0.40	0.52	0.47

Table 3: Effect of plant growth regulators on fruit weight, fruit length, fruit diameter of acid lime (*Citrus aurantifila* Swingle) Kuliana local.

Treatment	Fruit weight (gm)			Fruit length (cm)			Fruit diameter (cm)		
	1st season	2nd season	Pooled	1st season	2nd season	Pooled	1st season	2nd season	Pooled
T_1	28.99	29.15	29.07	4.52	4.54	4.53	4.06	4.08	4.07
T_2	29.15	29.47	29.31	4.55	4.59	4.57	4.07	4.09	4.08
T_3	29.77	31.06	30.42	4.65	4.69	4.67	4.10	4.15	4.12
T_4	30.08	31.25	30.67	4.67	4.69	4.68	4.11	4.19	4.15
T_5	29.32	29.65	29.48	4.57	4.64	4.61	4.07	4.09	4.08
T_6	29.65	29.88	29.77	4.60	4.65	4.63	4.11	4.14	4.13
T_7	30.34	31.47	30.91	4.69	4.71	4.70	4.17	4.19	4.18
T_8	30.65	31.90	31.28	4.76	4.79	4.77	4.19	4.24	4.22
T_9	30.96	32.22	31.59	4.88	4.82	4.85	4.19	4.27	4.23
T_{10}	31.14	32.55	31.85	4.91	4.90	4.91	4.25	4.30	4.28
T_{11}	31.36	32.88	32.12	4.93	4.93	4.93	4.22	4.32	4.27
T_{12}	31.85	33.15	32.50	4.92	5.00	4.96	4.28	4.34	4.31
T_{13}	32.18	33.56	32.87	4.99	5.05	5.02	4.30	4.39	4.35
T_{14}	32.59	33.64	**33.11**	5.04	5.09	**5.06**	4.32	4.39	**4.36**
T_{15}	27.17	28.07	**27.62**	4.51	4.55	**4.53**	4.02	4.07	**4.04**
Mean	28.20	31.32	30.83	4.75	4.78	4.76	4.16	4.22	4.19
SEm(±)	0.046	0.037	0.041	0.051	0.044	0.045	0.042	0.035	0.031
C.D. (5%)	0.015	0.012	0.014	0.017	0.014	0.015	0.014	0.012	0.011

REFERENCES

Bhat, Z. A., Reddy, Y. N., Srihari, D., Bhat, J. A., Rizwan Rashid and Rather, J. A. (2011). New generation regulators- Brassinosteroids and CPPU improve bunch and berry characterstics in Tas-A-Ganesh Grape. *International Journal of Fruit Science*, *11*, 309-315.

Baghel, M., Nagaraja, A., Srivstan, M., Meena, M. K., Kumar, M. S., Kumar, A. W. and Sharma, R. R. (2019). Pleiotropic influences of brassinolides on fruit crops: a review. *Plant Growth Regulation, 87*, 375–388.

Chaudhari, J. C., Patel, K. D., Yadav, L Patel, U. I. and Varu, D. K. (2016). Effect of plant growth regulators on flowering, fruit set and yield of custard apple (*Annona squamosa* L.) cv.Sindhan. *Adv.in Life Sci*., *5*(4), 1202-1204.

Devi, H. L., Sarkar, S. K., Dhanabati, L. and Mahiji, D. (2011). Flushing – flowering behaviour and regulation in acid lime - a critical review and research interventions. *J. crop and weed*., *7,* 87-90.

El-Boray, M. S., Mostafa, M. F. M., Salem, S. E. and El – Sawwah O. A. O. (2015). Improving yield and fruit quality of washington navel orange using foliar applications of some natural biostimulants. *J. Plant Production*, *Mansoura Univ.*, *6*(8), 1317–1332.

Eid, F., El-Kholy, M. and El, Samia Hosny (2016). Effect of foliar sprays application of Milagrow on yield and fruit quality of Avocado tree cv. Furette. *Journal of plant production, 7*(12), 1495-1499.

Gomes, M. M. A., Campostrini, E., Leal, N. R., Viana, A. P., Ferraz, T. M., Siqueira, L. N., Rosa, R. C. C., Netto, A. T., Nuñez-Vázquez, M. and Zullo, M. A. T. (2006). Brassinosteroid analogue effects on the yield of yellow passion fruit plants (*Passiflora edulis* f. flavicarpa). *Scientia Horticulturae*, *110*, 235-240.

Kacha, H. L., Viradia R. R., Leua H. N., Jat, G., Tank, A. K. (2012). Effect of NAA, GA3 andethrel on yield and quality of Phalsa (*Grewia asiatica* L.) under south-saurashtra conditions. *Asian J. Hort*., *7*(2), 242-245.

Khripach, V. A., Zhabinskii, V. N. and Groot, A. E. (1999). Brassinosteroids. A new class of plant hormones. Academics press, San Diego.

Kumar, R., Sharma, N., Jamwal, M., Sharma, R. M., Singh, D. B. and Parmar, A. M. (2012). Production and economic studies of PBRs treated strawberry (*Fragaria* × *ananassa* Duch.) cv. Sweet Charlie. *American-Eurasian Journal of Agriculture and Environmental Science, 12*(12), 1.

Kulkarni, S. S., Desai, U. T., Masalkar, S. D. and Desale, S. B. (1996). Effect of cultural and chemical treatments on yield and physiochemical characteristics of custard apple. *J.Maharashtra Agric.Univ.*, *21*(3), 474-475.

Mahorkar, K. D., Naglot, U. M., Navsare, R. I. and Chavhan, P. M. (2018). Effect of plant growth regulators on flowering, fruiting, fruit set and yield of custard apple (*Annona squamosa* L.). *Int. J. of Chemical Studies*, *6*(4), 2381-2384

NHB (2021-22) statistical data base national horticulture board (First advance estimates) of area and production of Horticultural crops.

Patel, N. M., Patel, D. K. and Patel, M. M. (2010). Effect of cultural and chemical treatments on fruit set and fruit quality of custard apple. *The Asian J. of Hort*., *5*(2), 498-502.

Roghabadi, M. A. and Pakkish, Z. (2014). Role of brassinosteroid on yield, fruit quality and postharvest storage of 'Tak Danehe Mashhad' Sweet Cherry (*Prunus avium* L.), *Agriculture Communication*, *2*(4), 49-56.

Sugiyama, K. and Kuraishi, S. (1989). Stimulation of fruit set of Motita navel orange with brassinolide. *Acta Hort*., *239,* 345-348.

Carlos Sotomayor, Nicolas Velasco, Roman Toro, Castro J. (2012). Influence of seven growth regulators on fruit set, pollen germination and pollen tube growth of almonds, *2*(9B), 1051-1056.

Yamini sapaha, (2020). Effect of foliar application of growth regulators and nutrients on fruit retention, yield and quality of acid lime. Thesis, Indira Gandhi Krishi Viswavidyala, Raipur.

Zicong Li and Yuehui, He (2020). Roles of brassinosteroids in plants reproduction. *Int. J. Mol. Sci.*, *21,* 872.

How to cite this article: Sarada P., Sahoo A.K., Sahoo S.C., Das S.N., Panda R.K. and Dash A. (2022). Enhancing Cropping by Agro Chemicals Spraying of Kuliana Local. *Biological Forum – An International Journal, 14*(3): 1702-1706.