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Influence of indigenous bee attractants on qualitative and quantitative parameters of cucumber (*Cucumis sativus* L.)

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Abstract

Cucumber is an important vegetable crop among cucurbitaceous crops. It depends on various pollinators specially bees. Studies were made on the role of honey bees on seed production of cucumber in Mahatma Phule Agricultural University, Rahuri. Dist: Ahmednagar, Maharashtra. The crop was raised with recommended packages of practices in Randomised Block Design with plot size 3.0 m x 3.0 m and spacing 1 X 0.5 m during kharip season 2017. Ten treatments viz., T1- Open pollination, T2- Pollination without insect, T3-Sugar solution 5%, T4 - Sugar solution 10%, T5 -Sugarcane juice 5%, T6 -Sugarcane juice 10%, T7 -Jaggery solution 5%, T8 -Jaggery solution 10%, T9- Molasses 5% and T10 -Molasses 10% were used for such experiment. The higher yield contributing characters like number of fruits (19.20 fruit/plant), Number of seeds (283 seeds/fruit), Test wt (10.72 g/fruit) and total yield (69.55 q/ha) were recorded in 10 per cent jaggery solution and found to be the best attractant followed by 5 per cent jaggery solution and 10 per cent sugar solution comparing with open pollination and pollination without insect.

Keywords: Pollination, honey bees, cucumber, bee

Introduction

Cucumber is an important and widely cultivated plant in the family cucurbitaceae. Overall production of cucumber in the world is 75.00 million tones and led by China with 76%. India is the second major producer of vegetables next to china. Cucurbits share about 5.6 % of the total vegetable production of India and according to estimate, cucurbits were cultivated in about 74 thousands hectares and production is 161,000 MT According to findings, Karnataka is the leading producer of cucumber with 120.77 thousand tones and share of 17.81 %, though Maharashtra stands 11th position in production with 19.28 thousand tones and share about 2.84% [1].

The flowering phenology of cucumber make it cross pollinated crop because of monoecious nature of flower. Honey bees act as effective pollinators in cucumber eco-system [3]. showed that the pollination activity of honey bees varies according to flowering phenology and showed that they attracted to staminate flower than pistillate flower. In fact, total pollination activity over 80 per cent is performed by honey bees therefore they considered as best pollinators [10].

Honey bees give good input to assured pollination resulting in higher yield by managing optimum population of bees. Various species of pollinators are recorded in cucumber eco-system but *Apis. dorata*, *A. cerana indica* and *A. florea* are most important pollinators found on cucumber [8].

Commercial bee attractants viz., beeline, bee here, bee scent, bee scent plus, fruit boost and bee-Q are being used to boost the yield of pear, peach, blue berries, watermelon and apple in United States, Spain and Canada [11]. However, in India studies on the use of bee attractants are indigenous like jaggery solution, sugar solution, honey solution and molasses proved as beneficial to boost the productivity of cross pollinated crops like cucumber [9]. The objective of this study was to determine the use of indigenous bee attractants to cucumber during flowering to promote pollination for increasing fruit quality and yield.

2. Materials and methods

An experiment was conducted during Kharif season of the year 2017-18 at PGI Experimental Farm, Department of Agril. Entomology, MPKV, Rahuri. Dist: Ahmednagar (Maharashtra) with 10 treatments and 3 replications. The variety used in such study was Himangi [2].

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For this study following attractants jaggery @ 10%, jaggery @ 5%, sugarcane juice @ 10% and 5 % sugar solution 5 % and 10% and molasses @ 10% and 5 % were used for the comparison and pollination without spray served as open pollination and the plot with cages served as pollination without insect. For each plot, we selected five plants with flower randomly. The agriculture field was introduced with heavy colonies of *Apis mellifera*. During the period of cucumber bloom, five selected fruit/trees were observed for recording data.

The data were subjected to suitable statistical analysis for inference after ($\sqrt{x+0.5}$) transformation [7].

3. Results and discussions

1. Number of fruit per plant

All the treatments which received attractants in which jaggery solution 10 per cent which recorded 19.20 fruits per plant was superior followed by sugar solution 10 per cent, jaggery solution 5 per cent and sugar solution 5 per cent which recorded 18.80 and 17.58 and 16.91 fruits per plant, respectively. Pollination without insect recorded lowest number of fruits (6.80 fruits / plant).

2. Number of seeds per fruit

The plot sprayed with jaggery solution 10 per cent was found significantly superior over all the treatments by recording highest number of seeds/fruit (283.00 seeds/fruit) which resulted in 48.94 and 55.67 per cent increase over open pollination without spray and PWI respectively. The next best treatment was jaggery solution 5 per cent (278.00 seeds/fruit) with an increase of 46.52 and 53.13 per cent over open pollination and PWI respectively and found at par with each other (Figure 1).

Molasses 10 per cent, molasses 5 per cent and sugarcane juice 10 per cent were the treatment which found superior over open pollination without spray and PWI by recording 264.20, and 247.66 and 224.00 seeds/fruit respectively. The remaining two treatment recorded least number of seeds/fruit viz., open pollination without spray and PWI recorded 190 and 181 seeds/fruits respectively.

These results clearly indicated that application of attractants are beneficial and has positive effect in increasing the number of seeds/fruits. This was due to increased visitation of bees that caused the well distribution of pollen thus it resulted in the effective cross pollination and better seed setting [5].

3. Per cent of crinkled seeds/fruit

According to the data depicted in figure no.7, treatment with jaggery solution 10 per cent noticed least number of crinkled seed/fruit and found superior over rest of treatments. This resulted in maximum of 45.82 and 60.32 per cent decreased over open pollination without spray and PWI, respectively and which was followed by sugar solution 10 per cent (10.41

crinkled seeds/fruit) with 38.29 and 54.81 per cent decrease over open pollination without spray and PWI respectively.

The next best treatment were jaggery solution 5 per cent (11.11 crinkled seeds/fruit) and sugar solution 5 per cent (10.90 crinkled seeds/fruit) by recording 34.14 and 51.78 and 35.38 and 52.69 per cent decrease over open pollination without spray and PWI respectively.

4. Test weight (weight of 1000 seeds)

The open pollinated crop which received jaggery solution 10 per cent (10.72 g/1000 seeds with an increase of (23.36 and 30.09) per cent over open pollination without spray and PWI, respectively. Jaggery solution 5 percent (10.45 g/1000 seeds) and sugarcane juice 5 per cent (10.30 g/1000 seeds) were the next best treatment which showed (20.25 and 26.82) and (75.76 and 25) per cent increase over open pollination without spray and PWI, respectively.

The plot which received spray of sugarcane juice 10 per cent was recorded the 10.06 g test weight which was followed by sugar solution 5 per cent, molasses 5 per cent molasses 10 per cent and recording 9.70, 9.05, and 9.02 g/1000 seeds weight and were significantly superior over open pollination without spray and PWI which recorded least test weight of 8.91 and 8.26g/1000 seeds respectively.

5. Yield of five plant in Kg

The highest seed yield per 5 plants was recorded in treatment with jaggery solution 10 per cent (6.26kg) followed by sugar solution 10 per cent (5.83 kg) and showed (35.20 and 37.28) and (25.91 and 27.85) per cent increase over open pollination without spray and PWI plot. Jaggery solution 5 per cent (5.97kg) was next best treatment. Sugarcane juice 10 per cent and molasses 10 per cent respectively which were independently superior over remaining treatments. The least seed yield of 5 plants 4.63 kg and 4.56 kg were recorded in treatment open pollination without spray and PWI, respectively which proved significantly inferior to all other treatments (Figure 2).

6. Net Yield/ha

The maximum yield per hector was recorded in plot which received jaggery solution 10 per cent (69.55 q/ha) and which was increase with 35.20 and 37.28 per cent over open pollination without spray and PWI respectively over open pollination without spray and PWI plot and found significantly superior over rest of the treatments (figure 3).

Next best treatment was the jaggery solution 5 per cent (67.28 q/ha) with increase of 30.79 and 32.80 per cent over open pollinated crop without spray and PWI and it was at par with sugar solution 5 per cent (62.55 q/ha).

The least yield of 50.66 q/ha was recorded in treatment PWI which proved significantly inferior to all other treatments [6].

Table 1: Effect of bees pollination on yield and seed contributing characters of cucumber.

Treatment	No. of fruits per plant	No. of seeds/ Fruits	Per cent increase over		Per cent crinkled seed	Per cent decrease over		Test weight in gm(1000 seeds)	Per cent increase over		Yield of fruits of 5 plants in kg	Per cent increase over		Yield per ha in Qtls.	Per cent increase over	
			OP	PWI		OP	PWI		OP	PWI		OP	PWI		OP	PWI
Sugar solution 5%	16.91	218.27	14.87	20.06	10.90	35.38	52.69	9.70	11.62	17.43	5.63	21.59	23.46	62.55	21.59	23.47
Sugar solution 10%	18.80	217.17	14.30	19.45	10.41	38.29	54.81	9.83	13.11	19.29	5.83	25.91	27.85	63.77	25.91	27.85
Sugarcane juice 5%	11.25	212.94	12.07	17.12	11.31	32.95	50.91	10.30	15.76	25.00	5.41	16.84	18.64	60.11	16.85	18.65

Sugarcane juice 10%	13.78	224.33	18.06	23.39	12.33	26.91	46.48	10.06	15.75	22.08	5.63	21.59	23.46	58.55	13.82	15.57
Jaggery solution 5%	17.58	278.66	46.52	53.13	11.11	34.14	51.78	10.45	20.25	26.82	5.97	25.91	27.85	67.28	30.79	32.80
Jaggery solution 10%	19.20	283.00	48.94	55.67	9.14	45.82	60.32	10.72	23.36	30.09	6.26	35.20	37.28	69.55	35.20	37.28
Molasses 5%	12.12	247.66	30.34	36.22	12.37	26.67	46.57	9.05	4.14	9.83	5.6	21.59	23.45	60.22	17.06	18.87
Molasses 10%	15.20	264.20	39.05	45.32	12.38	26.61	46.58	9.02	2.3	11.38	5.46	16.85	19.73	60.66	17.92	19.73
OP	9.81	190.00	-	4.5	16.87		26.78	8.91		20.52	4.63		1.53	51.44	0.000	1.540
PWI	6.80	181.80			23.04			8.26			4.56			50.66		
S.E. ±	0.20	1.59			0.13			0.20			0.10			0.59		
C.D. at 5%	0.60	4.73			0.40			0.63			0.30			1.72		

O.P- Open pollination

PWI- Pollination without insect

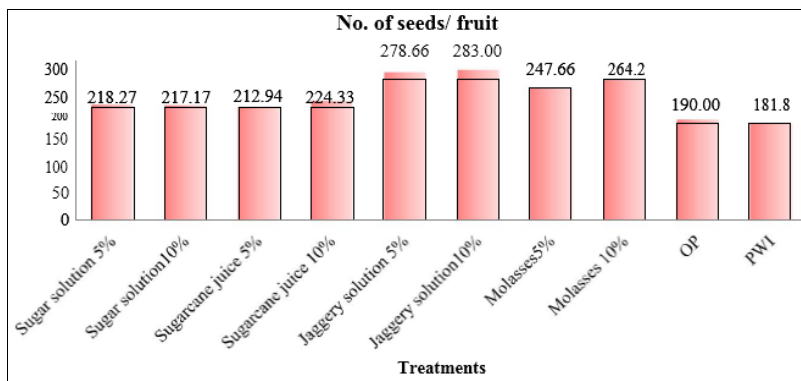


Fig 1: Effect of bee attractants on number of seeds/fruit

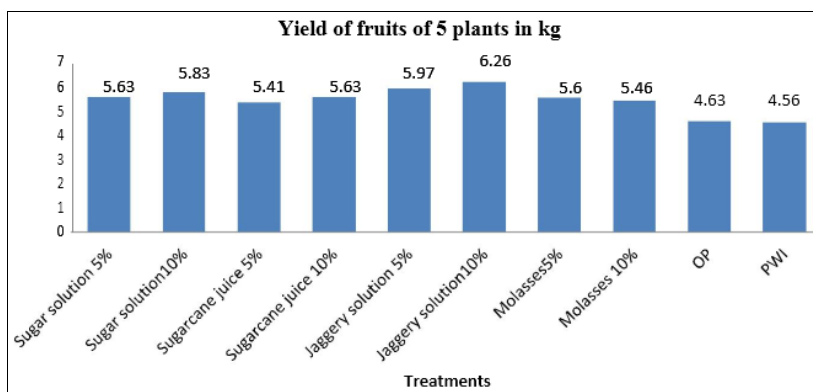


Fig 2: Effect of bee attractants on yield/ five plants

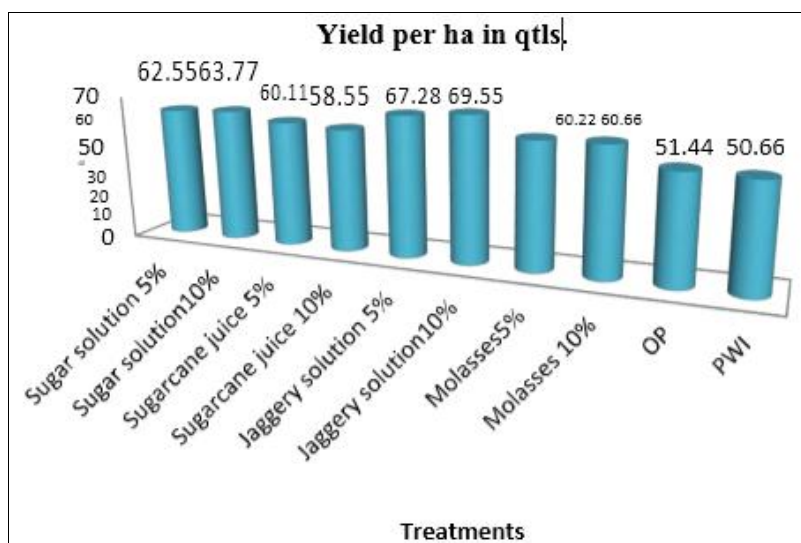


Fig 3: Effect of bee pollination on yield/ha.

The maximum number of seeds (283 seeds/fruit) were recorded in the treatment jaggery solution 10 per cent as against open pollination without spray (190 seeds/fruit) and PWI (181 seeds/fruit) which resulted in increase of 48.94 and 55.67 per cent over open pollination without spray and PWI, respectively.

Lowest per cent of crinkled seeds/fruit (9.14 %) recorded in the treatment with jaggery solution 10 per cent as against open pollination without spray (16.87 %) and PWI (23.04%). Higher test weight of 10.72 g in jaggery solution 10 per cent and 10.45 g in jaggery solution 5 per cent against 8.91 and 8.26 g in open pollination without any spray and PWI, respectively.

The crop sprayed with jaggery solution 10 per cent recorded highest plot yield of 6.26 kg/five plants, as against open pollination without spray (4.63 kg/five plants) and PWI (4.56 kg/five plants) by increasing 35.20 and 37.28 per cent over open pollination without spray and PWI, respectively. The next best treatment was jaggery solution 5 per cent (5.97 kg/five plants).

Similarly the highest net yield (69.55 q/ha) was received in the treatment jaggery solution 10 per cent as against open pollination without spray (51.44 q/ha) and PWI (50.66 q/ha). Next best treatments were jaggery solution 5 per cent and sugar solution 10 per cent which recorded 67.28 and 63.77 q/ha respectively^[4].

4. Conclusion

In conclusion, it appears that the higher yield contributing characters like number of fruits (19.20 fruit/plant), Number of seeds (283 seeds/fruit), Test wt (10.72 g/fruit) and total yield (69.55 q/ha) were recorded in 10 per cent jaggery solution and found to be the best attractant followed by 5 per cent jaggery solution and 10 per cent sugar solution. This is due to the foraging activity of pollinators. Apart from jaggery solution, sugar solution 10 per cent and 5 per cent and molasses 10 per cent and five per cent were next best treatments with increased fruit quality and production. Overall, this study suggests that use of bee attractants is an effective practice for enhancing qualitative and quantitative parameters of cucumber.

5. References

1. Anonymous. Indian Horticulture Database-National Horticulture Board, Government of India Publication. 2017; 165-166.
2. Anonymous. Krishi darshini-The agriculture Magazine published from MPKV, Rahuri, 2017.
3. Collison CH, Martin EC. Behaviour of honey bees foraging on male and female flowers of *Cucumis sativus*. Journal of apicultural research. 1979; 18:184-190.
4. Jayaramappa KV, Pattabhiramaiah M, Bhargava HR. Influence of Bee-attractants on yield parameters of Ridge Gourd (*Luffa acutangula* L.). World Applied Science Journal. 2011; 15(4):457-462.
5. Murasing S, Viraktamath S. Role of bee attractants in pollination and productivity of mustard (*Brassica juncea* L.). Proc. of 6th Asian Apic. Asso. (AAA) International Conference and World APIEXPO, 2002.
6. Nithya Chandran. Evaluation of indigenous bee attractants in enhancing the yield parameters of sesame and Niger. M. Sc. (Agri.) Thesis submitted to University of Agriculture Science, Dharwad (India), 2009.
7. Panse VG, Sukhatme PV. Statistical methods for

Agricultural Workers, Indian Council of Agricultural Research, New Delhi, 1978, 347.

8. Patil JS, Mokate GS, Mupade RV. Studies on the influence of bee attractants on bee visitation of *Apis dorsata* and *trigona* sp on Onion. International Journal of Plant Protection. 2010; 3(2):174-178.
9. Pateel MC, Sattigi HN. Effect of different attractants on attracting the bees to cucumber (*Cucumis sativa* L.) Crop. Karnataka Journal Of agricultural Sciences. 2007; 20:761-763.
10. Thapa RB. Honey bees and other insect pollinators of cultivated plants: Journal of Institute of Agriculture and Animal Science. 2006; 27:1-23.
11. Tidke PN. Studies on role of honey bees on seed production of onion (*Allium cepa* L.). M.Sc. (Agri.) Thesis submitted to Mahatma Phule Krishi Vidyapeeth, Rahuri. Dist-Ahmednagar. Maharashtra. (India), 2014.