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Effect of Period of Pollen Storage and Pollination Day after Flower Opening on Fruit Set and Seed Yield in Bitter Gourd (*Momordica charantia L.*) under shade house.

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Research Article

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ABSTRACT

A field experiment was carried out at the Hi-tech Horticulture Unit, Saidapur Farm, University of Agricultural Sciences, Dharwad during 2012-2013 to know the effect of period of pollen storage and pollination day after flower opening on fruit set, seed yield attributes in hybrid seed production of bitter gourd under shade house. There were three periods of pollen storage *viz*., pollination with fresh pollen (P_1), Pollination with one day stored pollen (P_2) and pollination with two day stored pollen (P_3) with four pollination day after flower opening *viz*., S_1: Pollination on the day flower opening, S_2: Pollination one day after flower opening, S_3: Pollination two day after flower opening, S_4: Pollination three day after flower opening. These 8 treatment combinations were laid out in two factorial RCBD design with three replications. The results revealed that the fresh pollen recorded significantly higher fruit set (72.36 %), fruit weight (98.42 g), seed weight per fruit (4.12 g), seed yield per plant (59.34 g). Among the different pollination days after flower opening, pollination on the day of flower opening recorded significantly higher fruit set (71.43 %), fruit weight (97.78 g), seed weight per fruit (4.04 g), seed yield per plant (58.48 g).

INTRODUCTION

Bitter gourd (*Momordica charantia* L.) is an important vegetable crop grown for its fleshy fruits in tropical and subtropical regions. As the name signifies, the fruits are bitter in taste. The bitter taste is due to the presence of momordicine, an alkaloid which is different from cucurbitacin present in other cucurbits. Bitter gourd belong to the genus Momordica of cucurbitaceae family and has a chromosome number 2n=22. The genus Momordica comprises nearly 23 species in Africa alone [3].

Shade house is an important structure to minimize biotic and abiotic stresses on crops, which could be grown round the year, during off-season and also under extreme climatic conditions. It provides a controlled environment inherently free from pests and diseases problems that increases the fruit and seed yield production and productivity per unit area as compared to open field condition. Microclimate control in shade house implies superior quality fruit yield, free from pathogens, insect bites and insecticidal residue.

The most productive and desirable hybrid seed can be obtained from the female parent when there is a perfect coincidence of stigma receptiveness and pollen viability. Obviously, day and time of pollination plays a crucial role in hybrid seed production of bitter gourd. Pollination is done usually on the day of flower opening itself and can be continued till noon hours, though peak anthesis is seen at 4:00 am to 8:00 am. But success rate of pollination varies in bitter gourd hybrid seed production since transfer of male pollens to the female flowers during crossing period is the most sensitive aspect in large scale

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production. The viable pollens deposited early on stigma may lead to poor seed setting due to non-receptive stigma and similar is the case if pollens are deposited very late on stigma due to drying of stigma and loss of pollen viability.

MATERIAL AND METHODS

The present experiment were carried out in *Rabi* season 2012-2013 in the Hi-Tech Horticulture Unit, Saidapur Farm, Main Agriculture Research Station, UAS Dharwad to study the effect of period of pollen storage and pollination day after flower opening on fruit set, fruit weight, seed weight per fruit, seed yield per plant attributes in hybrid seed production of bitter gourd under shade house. The experiment was laid out in randomized block design with factorial concept having three replications and eight treatments combinations.

The observations like fruit set computed, On 10th day after the end of last crossing date, the number of fruits retained on the mother plant were counted in the each of the tagged plants and fruit set percentage was computed by using the following formula.

$$\text{Fruit set (\%)} = \frac{\text{Number of crossed fruits retained on a plant}}{\text{Number of female flowers crossed per plant}} \times 100$$

The fresh weight of five bitter gourd fruits harvested from the labelled plants from each treatment were weighed and recorded. The mean values were expressed in grams. The experimental data were statistically analysed and presented as below.

RESULTS AND DISCUSSION

The fruit set percentage differed significantly due to period of pollen storage (pollen viability). Significantly highest (72.36 %) and lowest (31.64 %) fruit set percentage was noticed in P_1 (fresh pollen) and P_3 (two day stored pollen) respectively (Table 1).

Table 1: Effect of period of pollen storage (pollen viability) and pollination day after flower opening (stigma receptivity) on fruit set percent in seed parent Pusa hybrid -2 of bitter gourd

Treatments	Fruit set (%)			
	P_1	P_2	P_3	Mean
S_1	89.74	77.33	47.22	**71.43**
S_2	82.72	69.04	44.81	**65.52**
S_3	61.52	36.45	19.77	**39.25**
S_4	55.46	25.05	14.77	**31.76**
Mean	**72.36**	**51.97**	**31.64**	
	S.Em±	**CD @ 5%**		
P	1.33	3.90		
S	1.54	4.51		
P x S	2.66	7.81		

S_1- Pollination on the day of flower opening S_2- Pollination one day after flower opening
S_3 – Pollination two day after flower opening S_4 – Pollination three day after flower opening
P_1- Fresh pollens, P_2- One day stored pollens P_3- Two days stored pollens
NS – Non significant

Fruit weight differed significantly due to period of pollen storage. However, fruit weight (98.42 g) was significantly maximum in P_1 (fresh pollen) and followed by P_2 (one day stored pollen) which was recorded (78.09 g).Whereas, minimum fruit weight (59.01 g) was recorded in P_3 (two day stored pollen) (Table 2).

Period of pollen storage (pollen viability) was significantly influenced on the seed weight per fruit. Significantly highest seed weight per fruit (4.12 g) was recorded in P_1 (fresh pollen) and followed by P_2 (one day stored pollen) which was recorded (3.30 g). Whereas, lowest seed weight per fruit (2.48 g) was recorded in P_3 (two day stored pollen) (Table 3).

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Table 2: Effect of period of pollen storage (pollen viability) and pollination day after flower opening (stigma receptivity) on fruit weight (g) in seed parent of Pusa hybrid -2 of bitter gourd

Treatments	Fruit weight (g)			
	P_1	P_2	P_3	Mean
S_1	120.00	102.67	70.67	**97.78**
S_2	110.33	93.72	65.30	**89.78**
S_3	85.00	60.61	53.35	**66.32**
S_4	78.33	55.34	46.70	**60.12**
Mean	**98.42**	**78.09**	**59.01**	
	S.Em±		CD @ 5%	
P	1.21		3.56	
S	1.40		4.11	
P x S	2.43		7.12	

S_1- Pollination on the day of flower opening
S_2- Pollination one day after flower opening
S_3 – Pollination two day after flower opening
S_4 – Pollination three day after flower opening
P_1- Fresh pollens, P_2- One day stored pollens
P_3- Two days stored pollens
NS – Non significant

Table 3: Effect of period of pollen storage (pollen viability) and pollination day after flower opening (stigma receptivity) on seed weight (g) per fruit in seed parent of Pusa hybrid-2 of bitter gourd.

Treatments	Seed weight (g) per fruit			
	P_1	P_2	P_3	Mean
S_1	4.95	4.17	3.00	**4.04**
S_2	4.62	3.88	2.80	**3.77**
S_3	3.60	2.70	2.20	**2.83**
S_4	3.30	2.43	1.93	**2.55**
Mean	**4.12**	**3.30**	**2.48**	
	S.Em±		CD @ 5%	
P	0.05		0.14	
S	0.06		0.17	
P x S	0.10		0.29	

S_1- Pollination on the day of flower opening
S_2- Pollination one day after flower opening
S_3 – Pollination two day after flower opening
S_4 – Pollination three day after flower opening
P_1- Fresh pollens, P_2- One day stored pollens
P_3- Two days stored pollens
NS – Non significant

The seed yield per plant was differed significantly due to period of pollen storage. However, seed yield per plant (59.34 g) was significantly maximum in P_1 (fresh pollen) and followed by P_2 (one day stored pollen) which was recorded (35.51 g). Whereas, minimum seed yield per plant (15.85 g) was recorded in P_3 (two day stored pollen) (Table 4).

Table 4: Effect of period of pollen storage (pollen viability) and pollination day after flower opening (stigma receptivity) on seed yield (g) per plant in seed parent of Pusa hybrid -2 of bitter gourd

Treatments	Seed yield (g) per plant			
	P_1	P_2	P_3	Mean
S_1	87.48	61.03	26.93	**58.48**
S_2	73.82	51.65	23.27	**49.58**
S_3	42.18	18.00	8.05	**22.74**
S_4	33.87	11.35	5.15	**16.79**
Mean	**59.34**	**35.51**	**15.85**	
	S.Em±		CD @ 5%	
P	0.89		2.61	
S	1.03		3.01	
P x S	1.78		5.22	

S_1- Pollination on the day of flower opening
S_2- Pollination one day after flower opening
S_3 – Pollination two day after flower opening
S_4 – Pollination three day after flower opening
P_1- Fresh pollens, P_2- One day stored pollens
P_3- Two days stored pollens
NS – Non significant

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The marked increase in fruit set, fruit weight, seed weight per fruit and seed yield components noticed in fresh pollens followed by one day old as against two days old may be attributed to fact that the fresh pollens may have more number of viable pollens and also higher and longer pollen viability period compared to two day old pollens. This might have resulted in higher fruit setting and seed yield components. The two day old stored pollens recorded significantly the lowest values for fruit setting and seed yield components which may be attributed to the significant loss of pollen viability and also the shorter pollen viability period and it might have resulted in the poor seed setting and seed yield components compared to fresh pollen. These results are in agreement with findings of Petrova *et al.* [7] in brinjal, Islam and Khan [2] and Patil [6] in brinjal, Yogesha *et al.* [9] and Jolli [4] in tomato.

Pollination day after flower opening (stigma receptivity) was also significantly influenced fruit set percentage, fruit weight, seed weight per fruit and seed yield per plant. Significantly highest fruit set percentage (71.43 %), fruit weight (97.78 g), seed weight per fruit (4.04 g) and seed yield per plant (58.48 g) was recorded in S_1 (pollination on the day of flower opening) and fallowed by S_2 (pollination one day after flower opening) which recorded (65.52 %, 89.78 g, 3.77 g and 49.58 g, respectively). While, the lowest fruit set percentage (31.76 %), fruit weight (60.12 g) seed weight per fruit (2.55 g) and seed yield per plant (16.79 g) was recorded in S_4 (pollination three day after flower opening).

The increase in fruit set, fruit weight, seed weight per fruit and seed yield might be due to fact that stigma receptivity was high on the day of flower opening and on the other hand delayed pollination, particularly pollination three day after flower opening resulted in reduced fruit set. This may be due to the drying of stigmatic surface that led to the reduction in fruit set percentage and this will lead to the reduction in yield and yield attributes. These findings are in agreement with the reports of Aurswald [1], Sidhu *et al.* [8], Yogesha *et al.* [9] and Jolli *et al.* [5] in tomato.

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