

HYBRIDIZATION AMONG THE SELECTED GENOTYPES OF KENAF AND MESTA

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ABSTRACT

Eighteen genotypes of Kenaf including five F_1 s and eleven genotypes of Mesta along with three cultivated varieties were grown in pots at central station of Bangladesh jute Research Institute (BJRI) during August-September, 2021. A total of 226 crosses in Kenaf and 38 crosses in Mesta were made. Among them, 214 (191+23) crosses from 75 and 13 different cross combinations were successful in kenaf and mesta, respectively.

Key words: Hybridization, genotypes, kenaf, mesta.

Introduction

Plant breeding is a mechanism of changing the characters of plants for getting desired characteristics. It is being used to upgrade the quality of products for the benefit of human being (Hartung and Schiemann, 2014). Classical plant breeding means crossing or hybridization of pure lines, followed by artificial selection to get plants with desirable traits of higher yield, nutrition and resistance to diseases (Bauman and Crane, 1992). It helps to create recombinant by accumulating desirable genes for both qualitative and quantitative characters from diverse parents (Kar *et al.*, 2009). Through hybridization, it is therefore, possible to combine the desirable characters in a parent and to select superior progeny for varietal improvement program (Buerkle *et al.*, 2013; Zhou *et al.*, 2012). So, the hybridization program has been undertaken with 18 genotypes of Kenaf and 11 genotypes of Mesta including their checks for creating variability and to combine the desirable traits in a parent. Development of quick growing, short duration and stress resistant high yielding variety has been given the highest research priority under the context of global climate change. Genetic improvement through incorporating stress adaptive traits into good agronomic background is being duly emphasized in the variety development program.

Materials and Methods

Eighteen genotypes of Kenaf coded here with KP-5 (BJRI Kenaf-4), KP-13 (HC-95), KP-14 (BJRI Kenaf-3), KP₂₁ (KBL-51), KP₂₄ {KBL-155(1)}, KP-15, KP-16, KP-29, KP-30, KP-31, KP-32, KP-33, KP-34, F_1 {KBL-155(1) x KP₂₉}, F_1 {KBL-155(1) x HC-95}, F_1 (KP₁₅ x KP₂₉), F_1 {KBL-73(2) x HC-95}, F_1 (KBL-73 x KP₂₉); and eleven genotypes of Mesta namely MP-13 (HS-24), MP-14 (BJRI Mesta-3), VM-1(BJRI Mesta-2), ME-4, Acc.1740, MP-27, MP-28, MP-29, MP-30, MP-31 and SM-2 were used in hybridization program. Seeds were sown in pots at central station of BJRI during 1st September, 2021. Sowing was done two times at 15 days interval to ensure synchronization of flowering. At the time of flowering, a total 226 crosses in Kenaf and 38 crosses in Mesta were made. In the afternoon, the matured but un-opened buds were emasculated and bagged separately. Next morning, the emasculated flowers were pollinated by desired parent and tagging then bagging was done carefully. After ripening, the fruits were collected and seeds were threshed separately.

Table 1a. Eighteen genotypes of kenaf along with their salient features

Sl. no.	Kenaf Genotype	Salient features
1.	KP ₁₃ (HC-95)	Stem green, leaf palmate, flower cream red centre
2.	KP ₁₄ (BJRI Kenaf-3)	Stem green, leaf cordate, flower cream red centre
3.	KP ₅ (BJRI Kenaf-4)	Stem reddish dotted, leaf palmate, flower cream red centre

Sl. no.	Kenaf Genotype	Salient features
4.	KP ₂₁ (KBL-51)	Stem purple, leaf cordate, flower cream with red centre
5.	KP ₁₅ (A-4997)	Stem green, leaf palmate, pink flower
6.	KP ₁₆ (A-4857)	Cylindrical green stem, leaf palmate, pale pink flower
7.	KP ₂₉ (A-1657)	Stem light reddish, leaf palmate, flower completely cream
8.	KP ₃₀	Green stem, Leaf cordate, pale pink flower
9.	KP ₃₁	Green with trace reddish stem, leaf palmate, pinkish white flower
10.	KP ₃₂	Purple stem, leaf palmate, pink flower
11.	KP ₃₃	Stem green, leaf cordate, purple flower (white stigma)
12.	KP ₃₄	Greenish stem, leaf palmate, pink flower
13.	KP ₂₄ (KBL-155(1)	Reddish stem, cordate leaf, cream flower red centre
14.	F ₁ {KBL-155(1) x KP ₂₉ }	Stem reddish, leaf palmate, flower completely cream
15.	F ₁ {KBL-155(1) x HC-95}	Stem reddish, leaf palmate, flower completely cream, good growth.
16.	F ₁ (KP ₁₅ x KP ₂₉)	Stem reddish, leaf palmate, white red flower.
17.	F ₁ {KBL-73(2) x HC-95}	Stem reddish, leaf palmate, flower completely cream
18.	F ₁ (KBL-73 x KP ₂₉)	Reddish stem, leaf palmate, flower completely cream

Table 2b. Eleven genotypes of mesta along with their salient features

Sl. no.	Mesta Genotype	Salient features
1.	MP ₁₃ (HS-24)	Green having nodes purple pigmentation
2.	MP ₁₄ (BJRI Mesta-3)	Green stem, leaf palmate, flower completely yellow
3.	VM-1 (BJRI Mesta-2)	Stem red, leaf semi-cordate, fruit red with fleshy calyx
4.	ME-4	Greenish stem, semi-cordate leaf, fruit greenish with fleshy calyx
5.	Acc.1740	Full green stem, bushy type, leaf semi-cordate, fruit green, small with fleshy calyx
6.	MP ₂₇	Light reddish stem, leaf palmate, fruit reddish and less hairy
7.	MP ₂₈	Reddish stem, leaf palmate, fruit red and smooth, tall plant
8.	MP ₂₉	Reddish stem, leaf palmate, fruit round, light red, smooth
9.	MP ₃₀	HS-24 type, fruit green, smooth
10.	MP ₃₁	Reddish stem, leaf palmate, fruit red, smooth
11.	SM-2	Full green stem, leaf palmate, petiole both end purple color.

Results and Discussion

Eighteen genotypes of Kenaf and eleven genotypes of Mesta are presented in (Tables 1a-1b) with their unique characters. Kenaf plants started flowering in the second fortnight of October and continued for about two months. Mesta plants started flowering around one month later than Kenaf. At the time of flowering, a total of 226 and 38 crosses were made in Kenaf and Mesta respectively (Tables 2a-2b). Among them, seeds obtained from 191 and 23 successful crosses in Kenaf and Mesta, respectively with 75 and 13 different cross combinations. Seeds of all categories were carefully collected and preserved for future use.

Table 2a. List of cross combinations and total number of crosses in kenaf

Sl. No.	Cross combinations			No. of crosses made	No. of successful crosses
	♀	x	♂		
1.	HC-95		BJRI Kenaf-4	3	3
2.	HC-95		KBL-51	9	7
3.	HC-95		KP ₁₅	2	2
4.	HC-95		KP ₃₁	2	1
5.	HC-95		F ₁ {KBL-73(2) x HC-95}	8	6
6.	HC-95		F ₁ {KBL-155(1) x HC-95}	3	2
7.	BJRI Kenaf-3		KP ₃₃	4	4
8.	BJRI Kenaf-3		KBL-51	4	3
9.	BJRI Kenaf-3		KBL-155(1)	5	4
10.	BJRI Kenaf-3		KP ₃₀	4	3

Sl. No.	Cross combinations			No. of crosses made	No. of successful crosses
	♀	x	♂		
11.	BJRI Kenaf-3		KP ₃₂	2	1
12.	BJRI Kenaf-3		KBL-51	1	1
13.	BJRI Kenaf-3		F ₁ {KBL-73(2) x HC-95}	3	3
14.	BJRI Kenaf-4		HC-95	6	5
15.	BJRI Kenaf-4		KP ₃₁	4	3
16.	BJRI Kenaf-4		KP ₃₄	3	3
17.	BJRI Kenaf-4		KP ₃₂	3	3
18.	BJRI Kenaf-4		KP ₁₅	2	2
19.	BJRI Kenaf-4		KBL-51	1	1
20.	BJRI Kenaf-4		BJRI Kenaf-3	1	1
21.	BJRI Kenaf-4		F ₁ {KBL-73(2) x HC-95}	4	3
22.	KBL-51		BJRI Kenaf-4	7	6
23.	KBL-51		BJRI Kenaf-3	13	12
24.	KBL-51		KBL-155(1)	2	1
25.	KBL-51		HC-95	9	8
26.	KBL-51		KP ₁₆	2	2
27.	KBL-51		KP ₃₁	5	5
28.	KBL-51		KP ₃₃	5	5
29.	KBL-51		F ₁ {KBL-73(2) x HC-95}	6	5
30.	KP ₁₅		BJRI Kenaf-4	3	3
31.	KP ₁₅		HC-95	2	2
32.	KP ₁₅		KBL-51	1	1
33.	KP ₁₅		KP ₃₀	1	1
34.	KP ₁₆		HC-95	2	2
35.	KP ₁₆		KBL-51	2	1
36.	KP ₁₆		KP ₁₅	3	3
37.	KP ₁₆		KP ₃₀	2	1
38.	KP ₂₉		KP ₁₅	7	5
39.	KP ₂₉		KP ₃₂	2	2
40.	KP ₂₉		KP ₃₄	1	1
41.	KP ₃₀		BJRI Kenaf-4	1	1
42.	KP ₃₀		BJRI Kenaf-3	6	5
43.	KP ₃₀		KBL-155(1)	1	1
44.	KP ₃₀		HC-95	1	1
45.	KP ₃₀		KP ₃₃	4	3
46.	KP ₃₀		F ₁ {KBL-155(1) x HC-95}	1	1
47.	KP ₃₁		HC-95	5	4
48.	KP ₃₁		KBL-51	3	2
49.	KP ₃₁		KP ₁₆	1	1
50.	KP ₃₁		KP ₃₄	1	1
51.	KP ₃₁		F ₁ {KBL-73(2) x HC-95}	1	1
52.	KP ₃₁		KBL-17-1-9	2	1
53.	KP ₃₃		BJRI Kenaf-4	7	6
54.	KP ₃₃		BJRI Kenaf-3	6	5
55.	KP ₃₃		KBL-155(1)	1	1
56.	KP ₃₃		HC-95	2	1
57.	KP ₃₃		KP ₃₂	1	1
58.	KP ₃₃		KBL-51	1	1
59.	KP ₃₃		F ₁ {KBL-73(2) x HC-95}	1	1
60.	KP ₃₃		F ₁ {KBL-155(1) x HC-95}	1	1
61.	KP ₃₄		HC-95	3	2

Sl. No.	Cross combinations			No. of crosses made	No. of successful crosses
	♀	x	♂		
62.	KP ₃₄		KP ₃₂	2	2
63.	KP ₃₄		F ₁ {KBL-73(2) x HC-95}	1	1
64.	F ₁ {KBL-155(1) x KP ₂₉ }		HC-95	1	1
65.	F ₁ {KBL-155(1) x KP ₂₉ }		KBL-17-1-9	1	1
66.	F ₁ {KBL-155(1) x HC-95}		HC-95	2	1
67.	F ₁ {KBL-155(1) x HC-95}		BJRI Kenaf-4	1	1
68.	F ₁ {KBL-155(1) x HC-95}		KBL-17-1-9	1	1
69.	F ₁ {KP ₁₅ x KP ₂₉ }		HC-95	3	2
70.	F ₁ {KBL-73(2) x HC-95}		KBL-17-9-1	2	2
71.	F ₁ {KBL-73(2) x HC-95}		KP ₃₂	1	1
72.	F ₁ {KBL-73(2) x HC-95}		KP ₁₅	2	2
73.	F ₁ {KBL-73(2) x HC-95}		HC-95	7	6
74.	F ₁ {KBL-73(2) x HC-95}		KP ₃₁	1	1
75.	F ₁ {KBL-73 x KP ₂₉ }		HC-95	2	1
Total				226	191

Table 2b. List of cross combinations and total number of crosses in mesta

Sl. no.	Cross combinations			No. of crosses made	No. of successful crosses
	♀	x	♂		
1.	VM-1		ME-4	4	3
2.	ME-4		VM-1	3	2
3.	MP ₁₄		MP ₁₃	2	1
4.	MP ₃₀		MP ₁₄	4	2
5.	MP ₃₀		MP ₂₇	2	1
6.	MP ₂₉		MP ₁₄	5	3
7.	MP ₂₉		MP ₃₀	2	1
8.	MP ₃₀		VM-1	3	2
9.	MP ₂₉		SM-2	2	1
10.	MP ₁₄		SM-2	3	2
11.	MP ₁₃		MP ₃₀	4	3
12.	MP ₁₃		MP ₁₄	2	1
13.	MP ₃₀		MP ₁₃	2	1
Total				38	23

Conclusion

The crosses made in 2021 will be confirmed in next year.

References

- Bauman, L. F. and Crane, P. L. 1992. Hybrid Corn—History, Development and Selection Considerations. National Corn Handbook, No. 29. West Lafayette, IN: Purdue University.
- Buerkle, C. A, Wolf, D. E. and Rieseberg, L. H. 2013. The origin and extinction of species through hybridization. *In* Population Viability in Plants. Springer, Berlin, pp 117–141.
- Hartung, F. and Schiemann, J. 2014. Precise plant breeding using new genome editing techniques: opportunities, safety and regulation in the EU. *The Plant J.*, 78(5): 742-752.
- Kar, C. S., Kundu, A., Sarkar, D., Sinha, M. K. and Mahapatra, B. S.. 2009. Genetic diversity in jute (*Corchorusspp*) and its utilization: a review. *Indian J. Agric. Sci.*, 79 (8): 575-86.
- Zhou, G., Chen, Y., Yao, W., Zhang, C., Xie, W., Hua, J., Xing, Y., Xiao, J. and Zhang, Q. 2012. Genetic composition of yield heterosis in an elite rice hybrid. *Proced. Nat. Aca. Sci.*, USA 109: 15847–15852.