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Short Communication

Improved method for increasing the efficacy of hybridization in soybean [*Glycine max* (L.) Merill]

A. P. Agrawal, R. L. Ravikumar, P. M. Salimath and S. A. Patil

Department of Genetics and Plant Breeding, University of Agricultural Sciences, Dharwad 580 005

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In general, hybridization is difficult in pulses due to cleistogamous flower. Among pulses, soybean has a very small flower with diadelphous stamens surrounding stigma, that necessiate extreme care during emasculation. The cross pod set depends in soybean to a larger extent on environmental conditions and also on the personal skill. Generally emasculation is carried out one day before the pollination resulting in the exposure of stigma to unfavourable environmental conditions. The low humidity and high temperature under tropical and subtropical conditions lead to drying of small stigma, which is the chief cause of poor crossing success. In order to overcome drying of stigma, Kolot [1] suggested emasculating the flower in early morning (5.00 to 8.00 am) and crossing on the same day. Different methods such as crossing without emasculation using a dominant marker [2], use of optical microscope under artificial climate chamber [3] and in field conditions [4], grease proof paper with isolotar [5], pollen storage and crossing in the evening hours [6] were successful under temperate conditions. However such methods are tedious, cumbersome and expensive under tropical and sub tropical conditions. Hence the present investigation was undertaken to develop a simple technique to achieve higher cross pod set under Indian conditions in soybean.

The study was conducted with genotypes, Bragg, MACS-58 and JS-80-21 at University of Agricultural Sciences, Dharwad during *kharif* 1998. The female parent, Bragg is homozygous recessive for white flower colour (w_1w_1), while the male parents i.e. MACS-58 and JS-80-21 are homozygous dominant with purple flower colour (W_1W_1) [7]. The unopened flower bud was selected and the position of anthers was examined in selected buds. If the ring of 10 anters was not clearly visible below the stigma then the bud was discarded. Once the bud was selected, other flowers and buds at the node were removed. Anthers were removed using forceps in the selected buds. Three different methods as discussed below were used for crossing such emasculated buds using two male parents.

Traditional method : Emasculation at 15.00 to 18.00 hrs (previous evening) and pollination was made next day morning between 9.00 to 11.00 hrs.

Kolot method : Emasculation early in the morning between 5.00 to 8.00 hrs followed by pollination at 9.00 to 11 hrs [1].

Improved method : Emasculation was done like traditional method. Immediately after emasculation a small water wet cotton was put on the bud covering stigma. Pollination was done next day morning after removing the cotton between 9.00 to 11.00 hrs.

Hundred buds were pollinated for each of the above method and male parent. At maturity pods were harvested individually and seeds were planted during *rabi*/summer 1999. True hybrids were identified based on the flower colour and percentage of success of each method was determined.

The percentage of crossed pod and seed set by three methods are presented in Table 1. The average pod set (33.57%) and average seeds per pod (1.99) were highest in the improved method followed by Kolot method with a success of 15.72% pod set and 1.37 seeds per pod. The traditional method recorded the lowest success rate with 12.41% pod set and 1.22 seeds per pod. The higher success rate with of new method was due to covering of stigma with wet cotton, which prevents the stigma from drying. The covering also improve the micro-climate of the emasculated bud which helps the bud to recover from the injury, if any, made during emasculation. It also maintains high humidity, leading to reduced transpiration losses. Increased pod set by application of water drop in calyx cup was observed, while studying shedding of flower in soybean [8]. Although the success rate by this new

Table 1. Success rate of cross pod set (%) by different methods in Soybean

Methods	Parent	Cross pods set (%)			Seeds per pod		
	Male → Female ⇓	MACS -58	JS-80-21	Mean	MACS -58	JS-80-21	Mean
Present method	Bragg	32.14	35.0	33.57	2.01	1.97	1.99
Traditional method	Bragg	11.53	13.30	12.41	1.12	1.33	1.22
Kolot method	Bragg	14.72	16.72	15.72	1.32	1.42	1.37

Fig. 1. Emasculated soybean bud covered with wet cotton

method was slightly lower than the method suggested by Baraev [5], the technique is very simple and easy to follow under field conditions. The higher success rate reported by several researchers [1, 3-6] were under temperate conditions where the temperatures are moderate and humidity is more. In tropical and sub tropical conditions, the improved method proposed in the present study has given the best results. The method is very simple cheap and easy to follow. The improved method has an added advantage as it avoids, chance pollination from unknown pollen as the stigma is covered with cotton after emasculation.

The combination of improved method with the use of optical microscope for emasculation [4] may increase the efficiency under field conditions.

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