REPORT

METHODS AND PRACTICAL ASPECTS IN MUNGBEAN HYBRIDIZATION

K.N. Sivaiah[1], R. Narasimhulu[2], G.Govardhan[2] and R.Vinoth[3]

[1]Department of Seed Science and Technology, College of Agriculture,
Orissa University of Agriculture and Technology, Bhubaneswar-751003
[2]Department of Genetics and Plant Breeding, S.V.Agricultural college, Tirupati-517502
Acharya N.G.Ranga Agricultural University, Andhrapadesh.
[3]Department of Pulses, Centre for Plant Breeding and Genetics.
Tamil Nadu Agricultural University, Coimbatore – 641 003, Tamil Nadu, India

Abstract: Mungbean [*Vigna radiata* (L.) Wilczek] is one of the short duration pulse crop predominantly cultivated in Asia. It is a self pollinated crop where crossing or hybridization is tedious. Under field conditions easy and efficient crossing technique is needed to exploit genetic potential of mungbean. Due to complexity and lack of appropriate crossing technique, outcomes achieved have been less in mungbean. From last five decades scientists were developing different methods of hybridization to accelerate the success rate of crossing in mung. However Khattak and co-researchers developed efficient new technique where more pod setting was observed. Based on limited available information, this review summarizes the methods of crossing techniques and practical measures followed during hybridization in mungbean.

Keywords: *vigna radiata*, mungbean, crossing, hybridization

INTRODUCTION

Mungbean [*Vigna radiata* (L.) Wilczek] is third important pulse crop after chickpea and pigeon pea in India. It is widely cultivated throughout the Asia. It belongs to the family order leguminoseae and papilionoidae family. Inflorescence is axillary or terminal raceme and flowers are cleistogamous, papilionaceous flowers consists of five sepals, five petals consisting of one standard, two wing and two keel petals. Stamens are ten which may occur in two bundles 9+1 (diadelphous) condition. Style is up curved and stigma is bearded.

Crossing techniques: Crossing or hybridization plays a crucial role in manipulation of genetic architecture of any crop. Generally effecting cross-pollination in a strictly self-pollinating species is more difficult than vice-versa because for instance preventing self-pollination occurring inside the unopened flowers is cumbersome. To the knowledge of the authors, the techniques used to hybridize mungbean only few members were reported and concise here.

Boling *et al* (1961) introduced crossing technique in mungbean. In this method the young bud was grasped between the thumb and forefinger of the left hand. The point of a dissecting needle was inserted just under the standard in an oblique position along the top of the bud. The left side of the standard and the left wing petal were pushed outward away from the bud and held with the thumb of the left hand. The left half of the keel was removed in pieces with forceps. Extreme care was necessary in removing the left half of the keel to prevent injury to the delicate stigma. The pistil and stamens were then exposed and the anthers were removed with forceps. After emasculation, the pistil was pollinated immediately with desired pollen as the stigma appeared to be receptive. Pollination should be done by applying slight pressure at the base of the pollen flower; the stigma at the end of the keel was exposed with pollen. This stigma was brushed lightly against the stigma of the emasculated flower and pollination was completed. The left wing and standard were then closed to their original position on the bud. This served to protect the stigma from drying out and prevented damage by insects

Singh and Malhotra (1975) suggested high percentage of pod setting can be obtained by following emasculation of yellowish green buds in the evening (4:00pm to 6:30pm) and pollination of blossomed flowers in the next day morning(8:00am to 11:00am).However, simultaneous emasculation and pollination done during morning or evening shown low pod setting. Park and Yang (1978) also reported same procedure where emasculation in evening and pollination in the following morning gives maximum seed set. But simultaneous emasculation and pollination during morning 8:00am to 11:00am. Which results 3-4 seed pods normally. Due to less time period of crossing it limits the number of flowers to be pollinated which gradually results low pod set. It may be useful for researchers who require less quantity of seeds.

Cupka and Edwards (1986) introduced new technique where female bud was grasped between thumb and fore finger and right side of the standard was gripped with forceps approximately two-thirds the distance from the base along the ventral edge of the bud. The standard was then torn upward towards dorsal edge of the bud and removed. The wing petal if in the way was removed similarly in order to remove the keel petal. Using the point of the forceps, one side of the keel was slit open. By grasping the loosened flap. By grasping the loosened flap with forceps, the loosened tip of the keel was then removed and then stamens are removed. To pollinate the female parent, the pollen landed stigma of the

male parent gently brushed against the female parent. The pollinated flower was tagged and sealed by closing the opening of the standard petal with cellophane tape which helped the control of loss of moisture in the stigma by resealing the opening. The success rate of this technique is 60% with an average six seeds per pod per successful cross. But this technique is tedious and cellophane tape may stick to pollen used for pollination and the pollinated stigma.

Khattak *et al.*, (1998) developed new technique where only upper half of the floral bud was opened to expose stigma and lower half helps to protect the ovary and style in natural conditions. High pod setting was observed during summer and spring by emasculating at 5:00pm to 7:00pm and pollinating in following morning at 7:00am to 9:00am. The high success rate is mainly due to less disturbance on style and ovary in the bud during emasculation.

Some of the practical measures which may helpful during crossing

1. Plan the crossing programme during *rabi* season where monsoons may not obstruct. If green house is available it may possible at any season.
2. Sowing of parents should be done based on their maturity dates, so that flowering period may coincide. Follow staggered sowing for continuous supply of pollen.
3. Practice wide spacing (>40cm) between the rows helps in easy crossing. Paired row planting may be better than unpaired row of planting. Tagging of each row should be done for easy identification.
4. Select the yellowish green colour bud for emasculation. Observe the style should not be up curved. Mostly up curved style indicates matured bud.
5. Emasculation must be done carefully because flower buds of some varieties are very delicate. Care should be taken to remove 2/3 rd portion of the bud during emasculation. Follow ring cut method or keel rupture method for emasculation.
6. Select the flowers having abundant pollen for pollination and use one flower to pollinate each emasculated bud.
7. Crossing should be done without contacting other already pollinated flowers and keep only 2-3 crossed flowers in each inflorescence and remove the remaining flowers so that grain filling will be more.
8. Pollination should be done early in the morning 6:00am to 9:00am. However it may be extended during winter because of cool climate. After pollination use coloured threads to tie the pedicle.
9. In some situations like rainy days, crossing may not possible at that time remove the buds or flowers which we want to do on that day.
10. Fertilizers should be applied slightly more than recommended dose to supply nitrogen, phosphorus and potassium. Especially potassium may helps to increase disease tolerance.
11. Flower shedding is common and more during higher temperature. So during summer frequent irrigation helps in more pod setting
12. Knapsack sprayer or foot sprayer are better than power sprayer for spraying chemicals because power sprayer may drops or disturbs the crossed flowers.

REFERENCES

Boling, M.; Sander, D.A. and Matlock, R.S. (1961). Mungbean hybridization technique. Agronomy journal.53:54-55.

Cupka, T.B. and Edwards, L.H. (1986). A new technique for crossing mungbean. Crop science.26:830-831.

Khattak, G.S.S.; Haq, M.A.; Rana, S.A., Elahi, T. and Srinives, P. (1998). An efficient technique for crossing mungbean (*Vigna radiata* (L.) Wilczek). Thailand journal of agricultural science. 34(4):577-582

Park, H.G. and Yang, C.Y. (1978). The mungbean breeding programme at the Asian vegetable research and development center, p 214-216. *In* : Proceedings 1st international mungbean symposium. AVRDC, Shanhua , Taiwan.

Singh, T.P. and Malhotra, R.S. (1975). Crossing technique in mungbean (*Phaseolus aureus* Roxb.). Current Science.44:64-65.