

## **12. Emasculation and Pollination Techniques**

**Rice (*Oryza sativa*) (2n = 24)** (Family – Poaceae)

In rice anthesis commences shortly after emergence of panicle. Spikelets at the tip bloom first and proceed downwards. Anthesis time 8-10 am. Each spikelet remain open 30 minutes and then closes. The anther dehiscence takes place immediately after the opening of the spikelets. Receptivity remains for one day.

### **Emasculation and Crossing techniques**

Emasculation is necessarily followed by controlled pollination. Emasculation is done during early morning between 6 and 8 AM in spikelets, due to open on the same day. Emasculation should be over well ahead of the time of anthesis. Crossing techniques in rice differ based on the method of emasculation. Since maximum number of spikelets open on the 3rd or 4th day of anthesis, panicles of that stage are selected for emasculation. The following methods are widely used for hybridization in rice.

#### **1. Clipping method**

In the previous day evening, top 1/3rd and bottom 1/3rd portions in the panicle of the desired female parent are clipped off by using scissors leaving the middle spikelets. With the help of scissors again, top 1/3 portion in each spikelet is clipped-off in a slanting position. The six anthers present in each spikelet are removed with the help of the needle (Emasculation). Care must be taken during emasculation for not to damage the gynoecium. Then to prevent contamination from the foreign pollen, the emasculated spikelets are covered with a butter paper bag. In the next day morning (usually at 9.00AM), the bloomed panicle from the desired male parent is taken. The top portion of the butter paper bag which was originally inserted in the emasculated female parent is now cut to expose the panicle. The male parent panicle is inserted in an inverted position into the butter paper bag and sturned in both ways in order to disperse the pollen. After ensuring the abundant disbursement of pollen, the opened butter paper bag is closed using a pin. Coloured thread may be tied at the base of the panicle to identify the crossed ones. After ensuring pollination, the bag may be removed.

#### **2. Hot water method**

A method of hot water emasculation is used to about the same extent as the clipping method. Panicles in 3rd (or) 4th day of blooming are chosen as female parents. An hour or so before blooming (i.e. normally at 7. A.M.), the panicle is selected and under developed and

opened spikelets are removed. Now, the tiller is bent over (carefully to avoid breaking) and the selected panicle is immersed in hot water contained in a thermos bottle at 40-44°C for a period of 5 to 10 minutes. This treatment causes the florets to open in a normal manner and avoids injury. Then, emasculation is done by removing the six stamens by fine forceps or needles and then dusting should be done.

### **3. Dr. Ramiah method**

Panicles on the 3rd or 4th day of its blooming are selected; top and lower spikelets are removed leaving only the middle. It is covered with a wet cloth and air is blown from mouth. This facilitates opening of spikelets. After 2-3 minutes, wet cloth is removed and spikelets are found to be open. Then, the six anthers are removed.

### **4. Vacuum emasculation method**

This works on the principle of suction pressure. The spikelets are clipped off prior to operation. The minute pipette is to be shown at the point of clipping and pollen is sucked in. Six panicles can be emasculated at a time. By hand emasculation, 100 flowers can be emasculated by a person. With the vacuum emasculator, six persons can operate and emasculate 3000 to 3600 florets/hour.

### **5. Cuttack Method**

The technique was developed by CRRI, Cuttack. The panicle to be emasculated is inserted into hollow piece of bamboo closed at one end and plugged with cotton wool and split cork at the other end. The flowers thus enclosed will open within 5-10 minutes. The anthers are removed.

### **6. Brown paper method**

The panicles are enclosed in a Brown paper cover before a couple of hours of blooming. Heat develops inside due to which the anthers extrude, but do not dehisce. This happens in 15-30 minutes then the anthers are easily clipped off. Stigmatic surface is then dusted with pollen grains collected from the chosen male parent. The crossed panicle is then properly tagged and protected with paper cover which is retained in a position for 7 – 10 days.

### **7. Rhind's method**

In this method hot water is kept in the flask and it is poured outside. After pouring out the water inside of the flask will be warm and humid. The panicle to be emasculated will be inserted into the flask and kept for some time. Due to high temperature and humidity the

spikelets will get opened and the anthers are exposed which can be removed with the help of forceps.

**Wheat (*Triticum aestivum*) (2n = 42 Hexaploid) (Family – Poaceae)**

Much of the pollen grains shed within the floret and the crop is largely self pollinated. The glumes normally open during the flowering process, the anthers protrude from the glumes and part of the pollen grains is shed outside the flowers. Entry of foreign pollen at flower opening may result in a small extent of cross pollination which is normally less than one per cent.

**Selfing**

The inflorescence is covered with a butter paper cover prior to anthesis, and kept undisturbed till the flower opening completed.

**Emasculation**

On emergence of the ear upper 1/3rd of the spikelet is cut and lower spikelets are also removed. Of the remaining spikelets alternate ones on both sides of the axis are removed. The top spikele is held with forceps and pulled downwards and upwards to remove the upper florets of the spikelets. The glumes are separated and anthers left exposed are removed carefully and covered with butter paper cover.

**Crossing**

On the next day earhead selected from the pollen parent are used for crossing. The upper half of the glumes of the few medium spikelets are cut of and the ripened bright yellow anthers are rubbed on the styles of the emasculated florets and then covered.