

# Introductory plant breeding: A practical manual

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# Chapter 1

## Introduction

Introductory plant breeding practical manual is intended for B.Sc.Ag, 4th semester's course in Introductory plant breeding, although a wider readership (field researchers, lecturers, lab researcher and commercial practitioners) may benefit from it. Meanwhile the manually is continually evolving.



## Chapter 2

# Study of floral parts of field crops

### 2.1 Objectives

- To be familiar with different parts of flower and their functions
- To know the floral morphology and mode of pollination in crops

### 2.2 Theory

Flowers are the reproductive organs of a plant which lead to the development of fruit and seed. ? How flowers are important part of evolutionary history in crops ?

The floral morphology is the study of forms and features of flowers. ? Add a brief history to this ?

The genetic constitution of a crop depends on the mode of pollination of the crop ?. Floral morphology dictates the mode of pollination in flowers. Therefore, it becomes an essential for a plant breeder to know the structural organization and basic nomenclature associated with commonly cultivated crops' flowers.

```
# pdftools::pdf_convert("/home/deependra/Desktop/BSc_Ag_lectures/literatures/Plant Science Straus  
knitr::include_graphics("./images/rice_floret.png")
```

```
knitr::include_graphics("./images/rice_panicke.png")
```



Figure 2.1: Flower and fruit morphology of poales. Wheat, *Triticum aestivum* with (c) spelt and (d, e) wheat. (k) Wheat grain (caryopsis). (i, j) Rice, *Oryza sativa*. a point of emergence, c coleoptile, cr coleorhiza, d lemma, f fruit furrow, h glume, l vascular bundle, r radicle, s scutellum, v palea, vk shoot apex, w root cap, z cylindrical epithelium



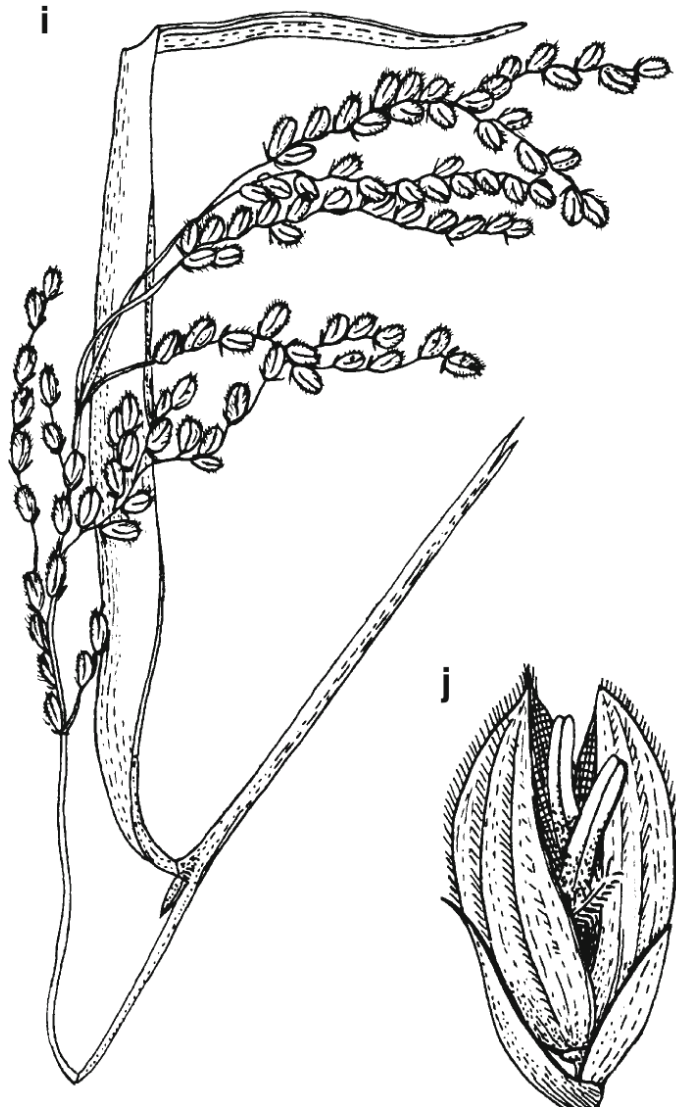


Figure 2.2: Flower and fruit morphology of poales. Wheat, *Triticum aestivum* with (c) spelt and (d, e) wheat. (k) Wheat grain (caryopsis). (i, j) Rice, *Oryza sativa*. a point of emergence, c coleoptile, cr coleorhiza, d lemma, f fruit furrow, h glume, l vascular bundle, r radicle, s scutellum, v palea, vk shoot apex, w root cap, z cylindrical epithelium

```
knitr::include_graphics("./images/wheat_kernel.png")
```

```
knitr::include_graphics("./images/wheat_spikelet.png")
```

```
knitr::include_graphics("./images/wheat_spike.png")
```

The type of habitat that a species inhabits in determines the reproductive biology of that adapted crop to a large extent. A range of vegetation types (based on habitat) are identified for order poales, including: - Woodland - Grassland - Heathland - Wetland - Desert - Polymorphous

Flower morphology in turn affects the choice of tools and techniques to be used for hybridization. Prominence of reproductive organs – Stigma and anther – which is largely conserved in a species (cleistogamous and ?), is among a number of factors determining the mode of reproduction and complexity of undertaking a manual crossing. More on hybridization techniques in Practical 4.

## 2.3 Materials required

- Flower,
- Scissor,
- Petri dish,
- Magnifying glass,
- Notebook,
- Pencil

## 2.4 Procedure

- A fresh sample of flowers are obtained of crops.
- Flowers are dissected in lab, their nature and morphology looked closely with the help of magnifying glass, and the observed impression is drawn in notebook.

### 2.4.1 Following structures can be observed

#### 1. Wheat/rice

- Bracteate type flower
- Inflorescence: Spike of spikelets or compound spikelets

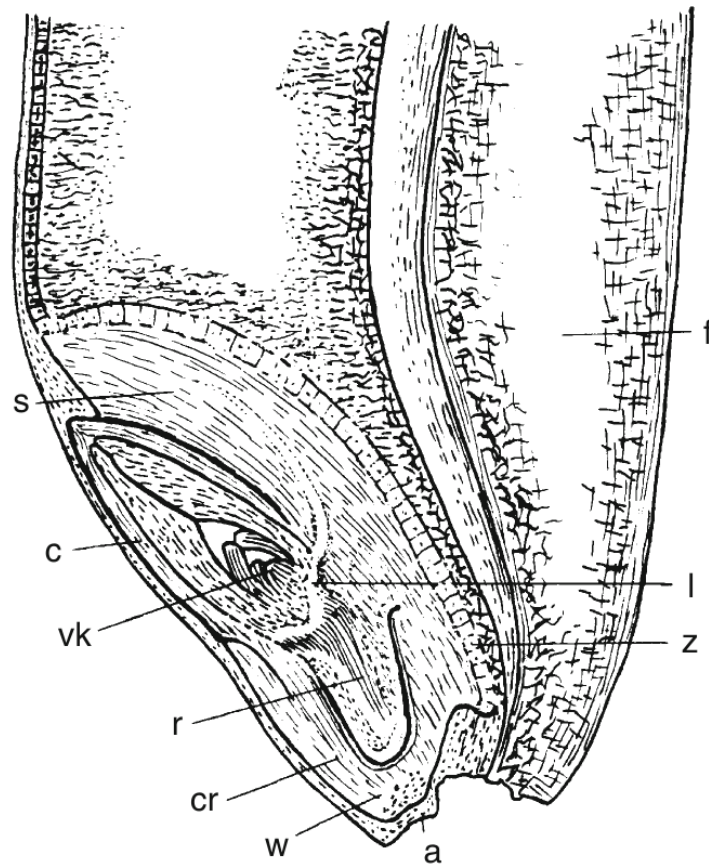


Figure 2.3: Flower and fruit morphology of poales. Wheat, *Triticum aestivum* with (c) spelt and (d, e) wheat. (k) Wheat grain (caryopsis). (i, j) Rice, *Oryza sativa*. a point of emergence, c coleoptile, cr coleorhiza, d lemma, f fruit furrow, h glume, l vascular bundle, r radicle, s scutellum, v palea, vk shoot apex, w root cap, z cylindrical epithelium

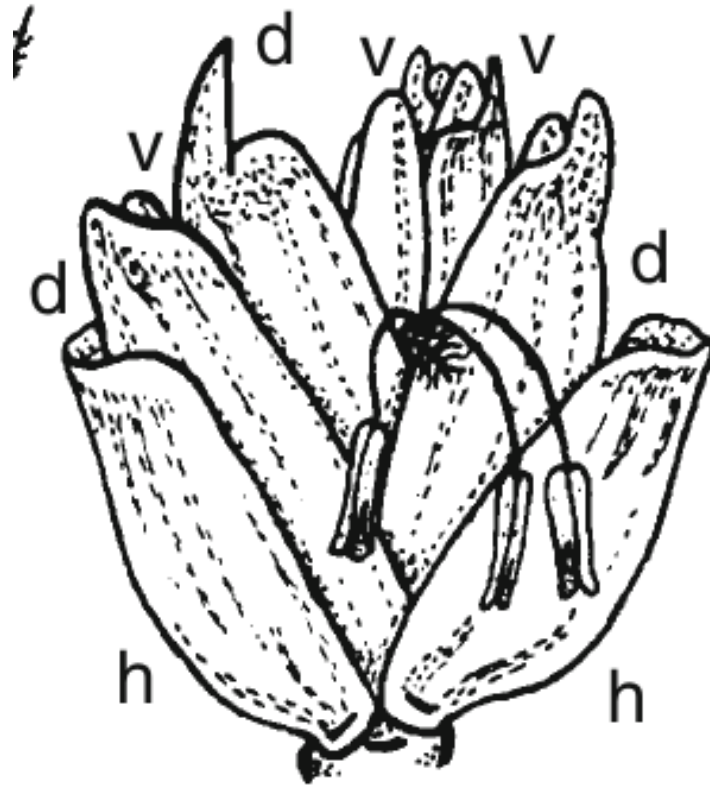


Figure 2.4: Flower and fruit morphology of poales. Wheat, *Triticum aestivum* with (c) spelt and (d, e) wheat. (k) Wheat grain (caryopsis). (i, j) Rice, *Oryza sativa*. a point of emergence, c coleoptile, cr coleorhiza, d lemma, f fruit furrow, h glume, l vascular bundle, r radicle, s scutellum, v palea, vk shoot apex, w root cap, z cylindrical epithelium



Figure 2.5: Flower and fruit morphology of poales. Wheat, *Triticum aestivum* with (c) spelt and (d, e) wheat. (k) Wheat grain (caryopsis). (i, j) Rice, *Oryza sativa*. a point of emergence, c coleoptile, cr coleorhiza, d lemma, f fruit furrow, h glume, l vascular bundle, r radicle, s scutellum, v palea, vk shoot apex, w root cap, z cylindrical epithelium

- Mode of pollination: Self pollination
- Flowers of wheat and rice are complete and bisexual.
- ? refer to wheat valentine blog post

## 2. Pea

- Flowers are pedicilate, zygomorphic and hermaphrodite
- Sepals are gamosepalous, pentamerous
- Petals have axillary aestivation
- Androecium: Superior ovary (epigynous)
- Pollination: Self pollinated

## 3. Potato:

- Bisexual, complete, regular flower, yellow colored and self pollinated
- ?

## 4. Maize

- In maize, male and female inflorescence are located on different parts, namely tassel and ear, respectively.
- ? details
- 95% of the times, pollination is cross and 5% of the time only self-pollination takes place.

## Chapter 3

## Conclusion

Hence, study of floral morphology done for some of the common crop species has inspired students about the importance of floral biology in overall reproductive habit of a crop and established that it's knowledge can aid in crop improvement activities, mainly through hybridization.





## Chapter 4

# Hybridization of crops available in the field

Here is a review of existing methods.



## Chapter 5

# Plant breeding data recording

We describe our methods in this chapter.



## Chapter 6

# Determining genetic purity

Genetic purity is determined by purity testing of a variety or cultivar.



## Chapter 7

# Maintaining genetic purity in the field

We have finished a nice book.





## Chapter 8

# Disease scoring and determining resistance and susceptibility to pests

Diseases are bad!

### 8.1 Resistance and susceptibility

### 8.2 Disease scoring



## Chapter 9

# Describing the traits for release of a new variety

We have finished a nice book.



## Chapter 10

# Study of activities at National Maize Research Programme (NMRP)

We have finished a nice book.



## Chapter 11

# Study of activities at National Grain Legumes Research Programme (NGLRP)

Is the NGLRP still in Rampur, Chitwan ?