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# Breeding for Disease Resistance in Pigeon Pea

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**Krunal Baria[1], S. S. Patil[2], Hemali Pandya[3]**

[1]PG Student, Dept. of Genetics & Plant Breeding, Anand Agricultural University, Anand-388 110, Gujarat

[2]Assistant Professor, College of Agriculture, Navsari Agricultural University, Bharuch-392 012, Gujarat

[3]PG Student, Dept. of Genetics & Plant Breeding, Navsari Agricultural University, Navsari-396 450, Gujarat

Pigeon pea [*Cajanus cajan* (L) Millsp.] is a versatile food legume, serving as a lifeline to resource poor farmers in tropical and subtropical regions of Asia, Africa and Latin America. It belongs to the family 'Fabaceae' and is also known as 'Arhar' or 'Tur', generally used in preparing '*Dal'* which is rich in protein (24-25%) and minerals and eaten by majority of Indian vegetarian population. Pigeon pea is diploid with 2n=2x=22 chromosomes. Pigeon pea is known for both a food crop (dried peas, flour or green vegetable peas) and a forage/cover crop. In combination with cereals, pigeon pea makes a well-balanced human food.

Pigeon pea is very drought resistant, so can be grown in areas with less than 650 mm annual rainfall. It contains 22.3% protein, 1.7% fat, 3.5% minerals, 1.5% fibre, 57.6gm carbohydrate, 73 mg Ca and 0.5 mg Fe, respectively as per 100 g of pigeon pea. It is contain vitamins and minerals such as thiamine, riboflavin, niacin, vitamin B-6, vitamin A along with phosphorus, potassium, zinc and sodium. In India, pigeon pea occupies an area of 4.82 million ha with the production of 3.88 million tones and 804 kg/ha productivity.

In India pigeon pea is suffered by three major disease including wilt (*Fusarium udum*), Phytophthora blight (*Phytophthora drechsleri* f.sp cajani) and sterility mosaic disease. Therefore, it is the need to release disease resistant hybrid of pigeon pea through breeding programme in order to stabilize the production for which identification of reliable disease resistant donors are important.

## 1) Fusarium Wilt

### Symptoms

- ❖ First indications of wilt - Patches of dead plants in the field at flowering or podding.

- Partial wilting - definite indication of Fusarium wilt and distinguishes this disease from termite damage & drought.
- Browning or blackening of the xylem.

### 2) Sterility Mosaic Disease

### Symptoms

- In the field, the disease can be easily identified by patches of bushy and show a light and dark green mosaic pattern.
- When infection occurs at 45 days after emergence or later, only some parts of the plant may show disease symptoms, while the remaining parts appear normal.

### 3) Phytophthora Blight

### Symptoms

- Phytophthora blight resembles damping off disease as the seedlings die suddenly.
- Infected plant has water-soaked lesions on their leaves.
- Brown to black, slightly sunken lesions on their stems and petioles.
- Lesions girdle on the main stems or branches which break at this point.

### Why Resistant Breeding?

- Cost effective
- To prevent yield losses
- Easily adaptable
- Eco-friendly for agriculture

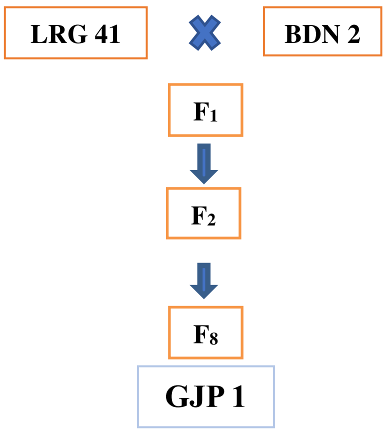
### Breeding Methods for Disease Resistance

- Plant Introduction
- Selection
- Hybridization
- Mutation breeding

Plant introduction is a process of introducing plants (a genotype or a group of genotypes) from their own environment to a new environment. Disease resistant varieties from other places within the countries or even between two countries can be exchanged. ICP 9145 pigeon pea wilt resistant variety introduced in Malawi from other country. ICP 00040 wilt resistant and ICP 8861 phytophthora blight resistant variety introduced in Tanzania from other country.

Isolation of plants having the desirable combination of characters based on their phenotype and growing their progeny is called selection. *C. acutifolius*, *C. albicans*, *C. lineatus* and *C. crassus*, species are selected from different locations which resistance against sterility mosaic disease. Different varieties of pigeon pea PA 291, VL Arhar 1, TS 3R, RGT 1 and TDRG 4 are released through pure line selection method which are effective against different pigeon pea disease.

Hybridization is used when resistant genes are available either in the germplasm or in wild species of crop plants. After hybridization, the hybrid material is handled either by pedigree method or backcross method.




**Average yield is 2115 kg/ha, Protein contain 19.51%, Resistance for wilt, SMD & blight disease.**

backcross method is useful to transfer disease resistance from one variety to another but it is also useful for transfer of other characteristics.

Mutation breeding is the process of exposing seeds to chemical, radiation or enzymes in order to generate mutants with desirable traits to be bred with other cultivars. Trombay Vishakha 1, CO-3, CO-5, TAT-5 and TAT-10 are pigeon pea disease resistance varieties developed through mutation breeding in India.

Looking to the importance of pigeon pea as a source of protein, disease resistance is primary importance for crop improvement programme. It is governed by particular dominant or recessive genes. By combining conventional breeding approaches, we can develop high yielding disease resistance varieties.

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