



## Crop Improvement Methods

- Hybridization:-
  - Intervarietal and Interspecific
- Open pollinated progeny selection
- Clonal selection
- Mutation
- Grafting

## BREEDING STRATEGIES & CROP IMPROVEMENT IN BLACK PEPPER



By



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### Spikes – Stages of growth

3-4 weeks for the full spike emergence  
Stigma emergence in 10-20 days  
Stigma receptivity 3-9 days

## Black Pepper $2n = 52$

*Piper nigrum* L. Piperaceae

- Origin - Western Ghats of South India
- Perennial climber
- Flushing & Spiking, Pollination by Rain
- Inflorescence – Spike, flowers sessile, bisexual, Protogyny
- *Piper colubrinum* – Resistant gene for *Phytophthora* foot rot disease

## Hybridization

Emasculation



Bagging



Pollination



PANNIYUR 1

PANNIYUR 1

- **FIRST HYBRID** in Black Pepper - 1967
- **Uthirankotta** x **Cheriakaniakadan**  
Female Male
- Potential yield - 8800 kg dry pepper/ha
- Average yield - 3850 kg dry pepper/ha
- Prefers open condition
- Large heart shaped green leaves
- Shoot tip colour – pale yellow
- Long spike , close setting , bold berries
- Drying % - 35



Uthirankotta x Cheriakaniakadan  
female male



**PANNIYUR 2**

- ❖ **Parent Balankotta -OP progeny Selection 1991**
- ❖ **Potential yield 3313 kg /ha dry pepper**
- ❖ **Average yield 2570 kg /ha dry pepper**
- ❖ **Tolerant to shade condition**
- ❖ **Small leaves - yellowish green**
- ❖ **Shoot tip- white , Spikes medium**

**PANNIYUR 2**

OP Progeny of Balankotta Small leaves

**PANNIYUR 3**

- **Parentage :**  
Uthirankotta x Cheriyananiakadan
- **Year of release -1991**
- **Potential yield -3269 kg dry Pepper/ha**
- **Average yield -1953 kg dry pepper/ha**
- **Prefers open condition**
- **Leaves – wavy margin**
- **Shoot tip colour – pale purple**
- **Long spike & High oleoresin content**

**PANNIYUR 3**





PANNIYUR 3  
LEAVES WAVY MARGIN



PANNIYUR 4



#### PANNIYUR 4

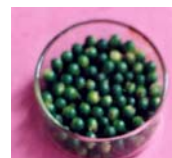
- ☞ Parent - Kuthiravally II clonal selection -released in 1991
- ☞ Potential yield -2443 kg dry pepper/ha
- ☞ Average yield -1277 kg dry pepper/ha
- ☞ Tolerant to shade condition
- ☞ Withstands adverse climatic



## PANNIYUR 5

- **PARENT** - **PERUMKODI OP PROGENY SELECTION**
- **YEAR OF RELEASE** - 1996
- **POTENTIAL YIELD** - 2248 kg dry pepper / ha
- **AVERAGE YIELD** - 1107 kg dry pepper / ha

- ☞ **SHADE TOLERANT**
- ☞ **PURPLE PIGMENTED SHOOT TIP**
- ☞ **LEAVES ARE OVAL IN SHAPE**

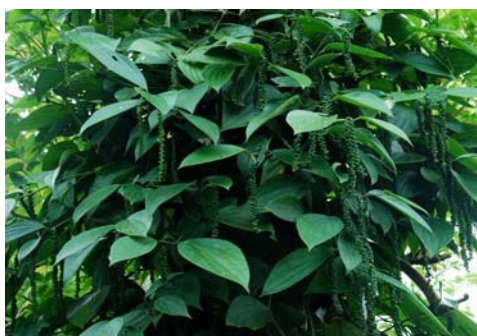


**PANNIYUR 5**

## PANNIYUR 6

- **PARENT** : **KARIMUNDA III CLONAL SELECTION**
- **Year of release** : 2000
- **POTENTIAL YIELD** : 3359 kg DRY PEPPER / ha
- **AVERAGE YIELD** : 2127 kg

- ☞ **SHADE TOLERANT**
- ☞ **WITHSTANDS ADVERSE CLIMATIC CONDITION**
- ☞ **BOLD ATTRACTIVE BERRIES**
- ☞ **FAINT PINK SHOOT TIP COLOUR**



**PANNIYUR 5**



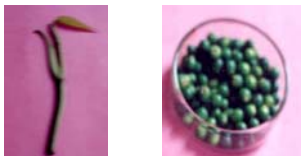
*Panniyur 6*



PANNIYUR 6



Panniyur 7



### PANNIYUR 7

- PARENT : KALLUVALLY TYPE IV  
OP Progeny
- Year of release : 2000
- POTENTIAL YIELD : 2770 kg DRY PEPPER / Ha
- AVERAGE YIELD : 1410 kg
  - SHADE TOLERANT
  - ADVERSE CLIMATIC CONDITION
  - FAINT PURPLE SHOOT TIP COLOUR
  - CORDATE LEAVES WITH WAVY MARGIN





## IISR VARIETIES

- SREEKARA
- SUBHAKARA
- PANCHAMI
- POURNAMI
- IISR THEVAM
- IISR GIRIMUNDA
- IISR MALABAR EXCEL
- IISR SHAKTHI

## QUALITY ATTRIBUTES

VARIETIES	PIPERINE	OLEORESIN	OIL	DRYING %
P 1	5.3	11.8	3.5	35.3
P 2	6.6	10.9	3.4	35.8
P 3	5.2	12.7	3.1	27.8
P 4	4.4	11.3	3.1	34.7
P 5	5.3	12.3	3.8	35.7
P 6	4.9	8.3	1.3	32.9
P 7	5.6	10.6	1.5	33.6

## SREEKARA

- YEAR OF RELEASE : 1990
- BREEDING METHODOLOGY : CLONAL SELECTION
- PARENTAGE : KARIMUNDA
- AVERAGE YIELD : 2677 kg DRY PEPPER/ Ha
- HIGH YIELD & OIL
- SLENDER VINE
- DARK GREEN BERRIES



## YIELD ATTRIBUTES

Varieties	Spike length cm	Berries / spike	1000 berry wt g	Setting %
P 1	17	125	145	96
P 2	12	45	127	74
P 3	15	68	153	89
P 4	9	38	116	86
P 5	13	51	110	86
P 6	8	53	130	99
P 7	19	133	150	92

## SUBHAKARA

- YEAR OF RELEASE : 1990
- BREEDING METHODOLOGY : CLONAL SELECTION
- PARENTAGE : KARIMUNDA
- AVERAGE YIELD : 2352 kg DRY PEPPER/ Ha
- HIGH YIELD AND ESSENTIAL OIL
- SLENDER VINE
- TOLERANT TO DROUGHT
- DARK GREEN BERRIES





**PANCHAMI**

- YEAR OF RELEASE : 1991
- BREEDING METHODOLOGY : SELECTION
- PARENTAGE : AIMPERIAN
- AVERAGE YIELD : 2828 Kg DRY PEPPER/ ha
- BERRIES ARRANGED ON FIVE DISTINCT ROWS
- LATE MATURING TYPE
- HIGH SPIKE DENSITY
- MEDIUM LONG SPIKES

**Name**

Pedigree  
Released from

**IISR Girimunda**

Hybrid (Naranyakodi x Neelamudi)  
Indian Institute of Spices  
Research, Calicut

Average yield, Dry (kg/ha) 2880.0  
Oleoresin (%) 9.65  
Piperine (%) 2.2  
Essential Oil (%) 3.4

**POURNAMI**

YEAR OF RELEASE : 1991

- ☐ BREEDING METHODOLOGY : SELECTION
- ☐ PARENTAGE : OTTAPLACKAL 1
- ☐ AVERAGE YIELD : 2333 Kg DRY PEPPER/ Ha
- ☐ TOLERANT TO ROOT KNOT NEMATODE

**Name**

Pedigree  
Released from  
Average yield, Dry (kg/ha)  
Oleoresin (%)  
Piperine (%)  
Essential Oil (%)

**IISR Malabar Excel**

Hybrid (Cholamundi x Panniyur 1)  
Indian Institute of Spices Research, Calicut

1453.0  
14.7  
3.0  
3.2

**Name**

Details

Pedigree

Released from

Average yield, Dry (kg/ha)

Oleoresin (%)

Piperine (%)

Essential Oil (%)

**IISR Thevam**

Field tolerant to disease (foot rot).  
Suited to high altitudes and plain field  
Clonal selection of 'Thevanmudi'  
Indian Institute of Spices Research,  
Calicut

2437.0

8.15

1.6

3.1

**Name**

Pedigree -

**IISR Shakti**

OP Perambramundi Tolerant to foot rot





**QUALITY ATTRIBUTES**

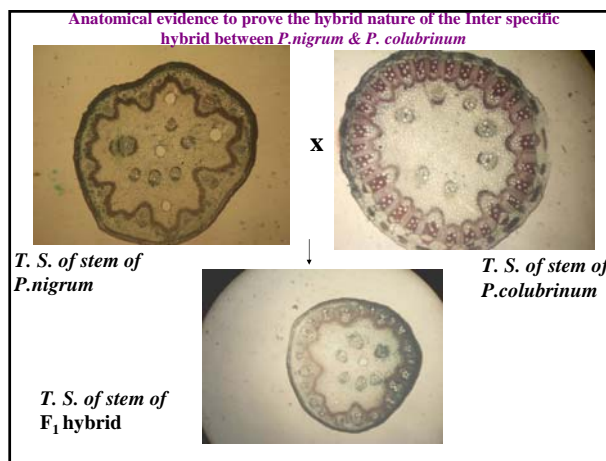
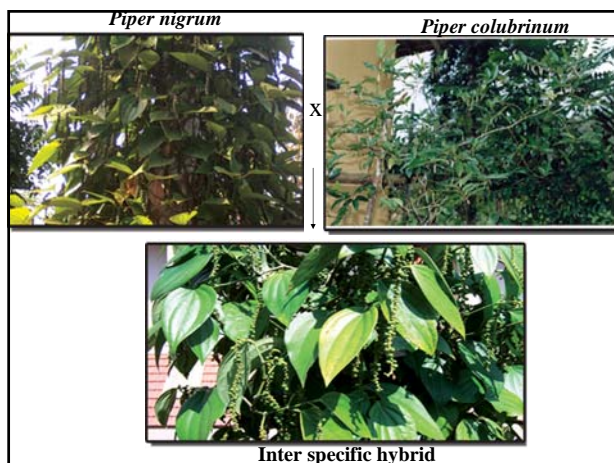
VARIETIES	PIPERINE	OLEORESIN	OIL
Sreekara	5.1	13.0	7.0
Subhakara	3.4	12.4	6.0
Panchami	4.7	12.5	3.4
Pournami	4.1	13.8	3.35
ISSR Thevam	1.6	8.2	3.1
IISR Girimunda	2.2	9.7	3.4
ISSR Malabar excel	3.0	14.7	3.2
ISSR Shakthi	3.3	15.5	3.5

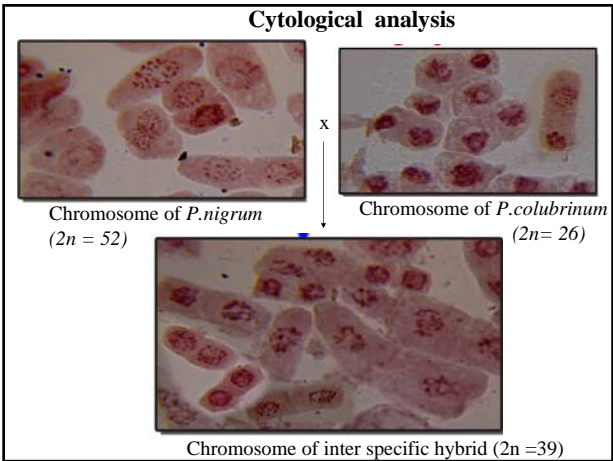
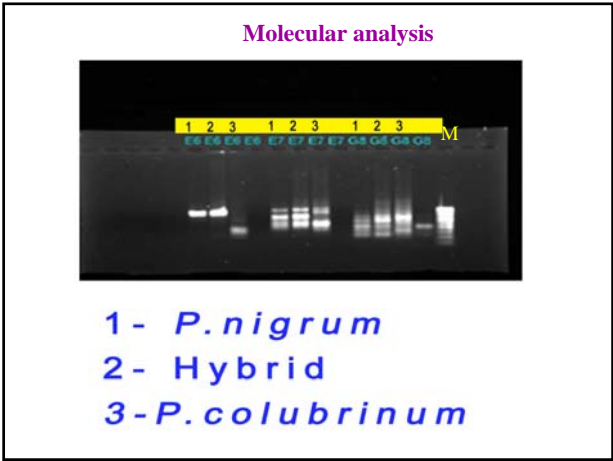
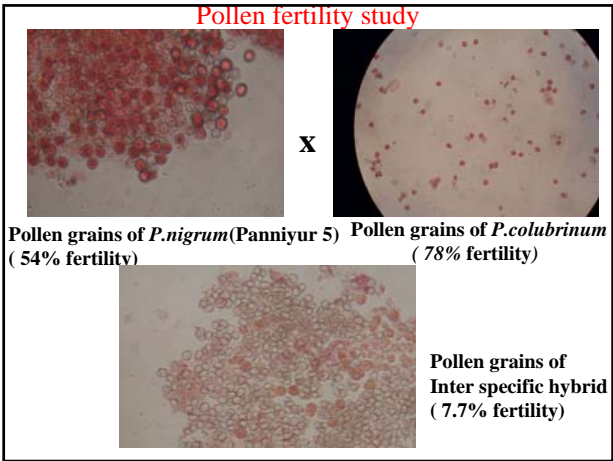
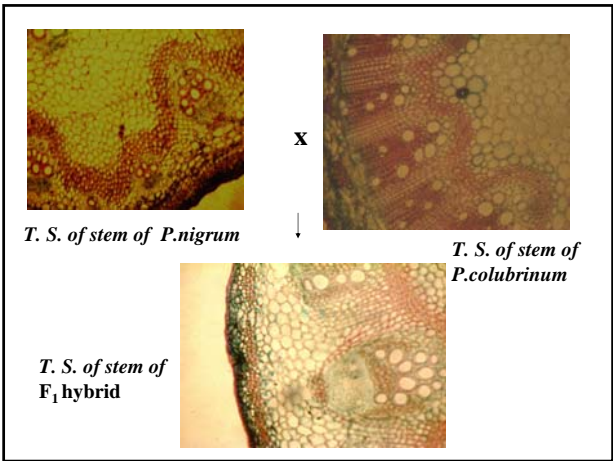
**Culture P5PC –1****(First interspecific hybrid with *P.colubrinum*)**
**INTERSPECIFIC HYBRIDIZATION**  
**for *Phytophthora* foot rot resistance**  
**at PRS, PANNIYUR**

- *Piper nigrum* x *Piper colubrinum*
- Partly fertile
- Partial resistance
- $2n = 39$
- Long spike , poor setting
- More number of spikes

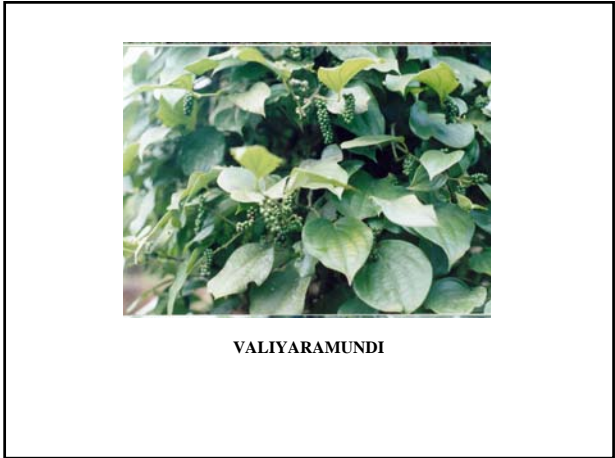
**Morphological analysis***P. Colubrinum* exhibiting anchoring root habit

Hybrid seedling exhibiting anchoring root habit











North Eastern Fragrant Pepper (PRS 149)-An alternative source for *Phytophthora* foot rot resistance in black pepper



### Future breeding

- Resistance breeding
- Phytophthora foot rot, Viral diseases and drought
- Short stature , more laterals
- High spiking capacity
- Regular yielder
- High quality



P.attenuatum

THANK YOU



### GERMPLASM CONSERVATION

- Pepper Research Station, Panniyur
- IISR, Calicut
- NBPGR , Trichur
- NBPGR, New Delhi

