IARI BEST PRACTICES

1. Title of the Practice

Breeding high yielding and widely adapted varieties of Pigeonpea

2. Objectives of the Practice

Pigeonpea is the second important pulse crop of the country after chickpea. It is a major and cheap source of protein compared to animal protein. It is mainly used as split dal for making soup or curry. India is the major pigeonpea producing country contributing almost 80% of total production and area in the world. Pigeonpea occupies 4.8 million ha area in India with a production of 4.32 million tons and productivity of 900 kg/ha (AICRP Report, 2022). AS per the second advance estimate of DAC and FW the production figure of pigeonpea is 4.0 million tons for the year 2021-22.

3. The Context

It is important to develop high yielding short duration varieties with improved plant architecture (dwarf and semi-dwarf) suitable for high density planting and mechanised cultivation in order to increase yield per unit area, per unit time and also to stabilise the production. These varieties would enable growing of the following rabi crops, like potato/mustard/chickpea/wheat, thereby increasing the cropping intensity and ultimately the income of the farmers. Testing and release of extra early maturing varieties in other states like Tamil Nadu, Telangana, Karnataka, MP and North East states is very important in order to maximise area. In these regions experiments should be taken up for deciding proper sowing dates of extra early maturing varieties in order to avoid exposure of flowering period to heavy rains. Breeding for bolder seed size (9 to12 g/100 seeds) in the short duration varieties is also very important.

4. The Practice

New high yielding Pigeonpea varieties with improved plant type developed by ICAR-IARI, New Delhi

ICAR-IARI, New Delhi has developed 4 new Pigeonpea varieties with improved plant type viz., Pusa Arhar 16, Pusa Arhar 2017-1, Pusa Arhar 2018-2 and Pusa Arhar 2018-4. Out of these four varieties, Pusa Arhar 16 and Pusa Arhar 2017-1 are of extra early maturity and after their harvest mustard/chickpea/potato/wheat can be grown in following Rabi season. Pusa Arhar 16 was released in 2018 while other three varieties were notified in 2021. Pusa Arhar 16 is suitable for mechanized cultivation. Pusa Arhar 2018-2 and Pusa Arhar 2018-4 are of early maturity and after their harvest wheat can be grown in the rabi season. Pusa Arhar 2018-4 was notified for NWPZ in 2021 by CVRC. The basic characteristics of these varieties have been presented below

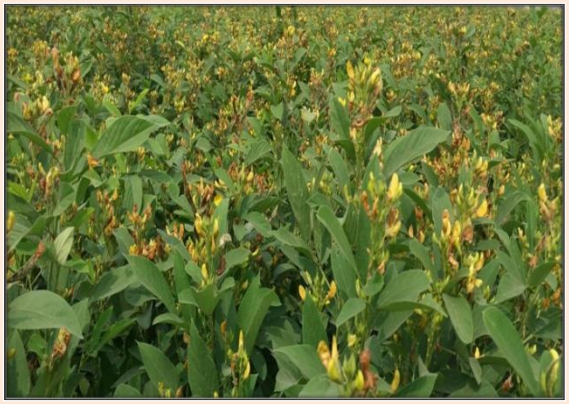
1. **Pusa Arhar 16: "**Pusa Arhar 16**"** is an extra early maturing semi-erect, semi-dwarf pigeonpea variety suitable for mechanized cultivation. Pigeonpea variety Pusa Arhar 16, developed by ICAR-IARI, New Delhi, was released in 2018 by SVRC and notified in 2018 (S O 1379 (E) 27-03-2018 for Delhi and NCT. Pusa Arhar 16 is extra early (120 days) maturing, semi-dwarf, determinate, high yielding variety with semi-erect compact plant type which is suitable for combine harvesting. Its extra early maturity allows growing of mustard/wheat/potato after its harvest. Thus, cropping intensity can be increased. Due to its semi-dwarf stature spraying of insecticide is easy and efficient with knapsack sprayer. This variety is unique as mechanized harvesting is very much possible due to high density (30 cm Row x Row spacing) of semi-erect compact and semi-dwarf plant types. It also has very good dal quality and relatively lesser cooking time than other varieties.

Pusa Arhar 16 had mean yield of 2021.5 kg/ha over two years 2012 and 2013 in the Station Trial at IARI, New Delhi which was higher than the mean yield of the check varieties ICP 88039 (VLA-1) (1253.5 kg/ha) and PS 4242 (1528 kg/ha). It had yield of 2023.5 kg/ha during 2014 at IARI, New Delhi in large plot size (126 Sq. m) which was higher than the yield of the check variety Pusa 991 (1527 kg/ha). It yielded 1839.55 kg/ha, with date of sowing 09/07/2017, in crop cutting experiment at IARI, New Delhi during Kharif, 2017. At SKAF Mandsaur it yielded 2015 and 2118 kg/ha during Kharif 2015 & 2016, respectively (in large plot size plot 80 sq. m and 192 sq. m, respectively) as against the yield of the check variety Pusa 991 (1618 kg/ha and 1659 kg/ha, respectively). In IVT (EE) trial mean days to 50% flowering over locations of Pusa Arhar 16 was earlier than PAU881 by 10 days, Paras by 16 days and VLA1 by 25 days. In IVT (EE) trial days to maturity over locations of Pusa Arhar 16 was earlier than PAU881 by 3 days, Paras by 7 days and VLA1 by 11 days.

Competitive advantage of Pusa Arhar 16

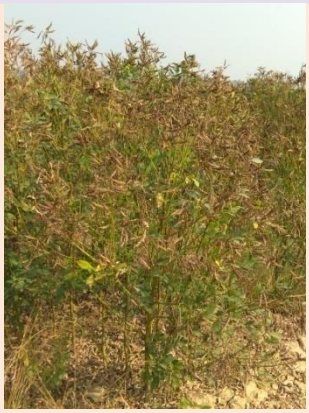
This variety is extra early and can be harvested in 120 days. It can be sown from 1st week of June to 1st week of July. After harvest of this variety chickpea/mustard / wheat can be grown to increase cropping intensity. Hence, this variety increases yield per unit area per unit time. As it is semi-dwarf in plant type application of insecticide is easier and efficient to control various insects of pigeonpea. Also mechanized harvesting can be carried out as the plant type is semi-erect and semi-dwarf with synchronous maturity. This variety has also good dal quality.

Pusa Arhar 16



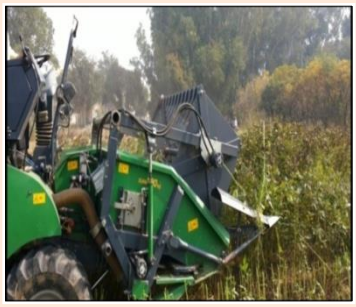
Pusa Arhar 16

View of single plant

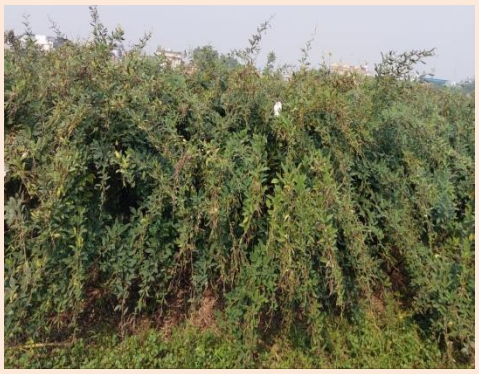
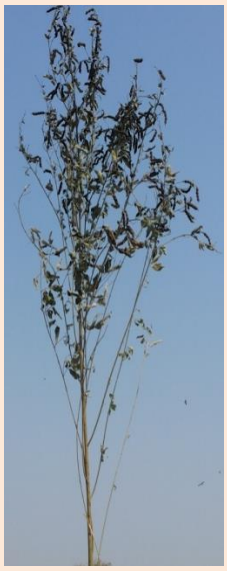
Pusa Arhar 16

Mechanized harvesting in process




Seeds

2. **Pusa Arhar 2017-1:** Pigeonpea variety Pusa Arhar 2017-1, developed by ICAR-IARI, New Delhi, was released in 2021 by SVRC and notified in 2021 S.O. 2986(E), 20.07.2021 for Delhi and NCT. This variety is indeterminate and has semi-erect compact plant type. It is suitable for sole cropping and also for dense planting due to its compact semi-erect plant type. This variety matures in 122 days (range from 120-125 days) which enables growing of mustard/chickpea/potato/wheat after its harvest. Thus, cropping intensity can be increased by growing this variety. It has average yield of 21.16 q/ha and has potential yield up to the tune of 21.57 q/ha. This variety has mean 100 seed weight of 7.5 g.

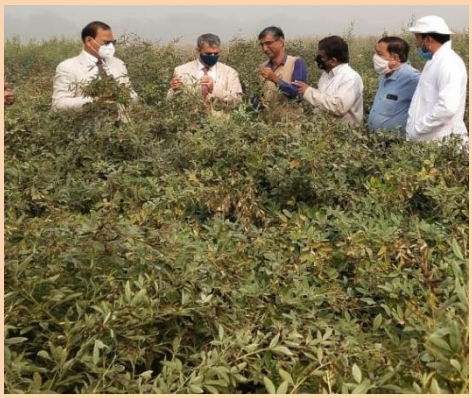
Pusa Arhar 2017-1	
Field view	
	
Seeds	**Single plant**
	

3. **Pusa Arhar 2018-4 - Newly released Pigeonpea variety Pusa Arhar 2018-4 for NWPZ:** Pigeonpea variety Pusa Arhar 2018-4, developed by ICAR-IARI, New Delhi, was released in 2021 by CVRC and notified in 2021 (S.O. 8(E). 24.12.2021) for **NWPZ (Punjab, Delhi, Haryana, Western Uttar Pradesh)**. This variety is suitable for "Pigeonpea - wheat rotation" in NWPZ. This variety matures in 140-145 days and has got yield potential up to the tune of 23.06 q/ha. This variety has bolder seed size (mean 100 seed weight of 8.73 g) as compared to other released varieties for NWPZ. Pusa Arhar 2018-4 had lower incidence of wilt, SMD

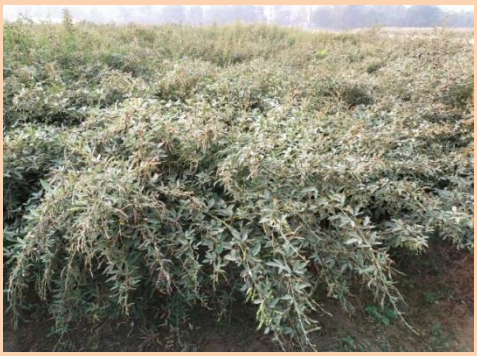
and Phytophthora Blight as compared to respective susceptible Checks in most of the locations of various Zones in all the three years of testing (2018-19, 2019-20 and 2020-21). This variety has seed protein content of 22.75 %.

Pusa Arhar 2018-4

Field View



Field View



Seeds

Single plant

4. **Pusa Arhar 2018-2**: Pigeonpea variety Pusa Arhar 2018-2, developed by ICAR-IARI, New Delhi, was released in 2021 by SVRC and notified in 2021 S.O. 2986(E), 20.07.2021 for Delhi and NCT. This variety is indeterminate and has semi-erect compact plant type. It is suitable for sole cropping and for "Pigeonpea - wheat rotation". This variety matures in 131 days (range from 128-138 days) and has got average yield of 20.09 q/ha and has potential yield up to the tune of 23.0 q/ha. This variety has mean 100 seed weight of 8.2 g.

Pusa Arhar 2018-2		
Seeds	**Field View**	**Single plant**
		

Uniqueness of varieties

1. **Pusa Arhar 16 :** Extra early maturity (120 days), determinate, semi-erect compact, semi-dwarf plant type suitable for mechanized cultivation. Due to its semi-dwarf stature spraying of insecticide is easy and more efficient. Its extra early maturity (120 days) allows growing of mustard/potato/chickpea/wheat after its harvest. Thus, cropping intensity can be increased.
2. **Pusa Arhar 2017-1:** Extra early maturity (120-125days), indeterminate type, compact semi-erect plant type.
3. **Pusa Arhar 2018-2:** Early maturing (131 days), indeterminate, semi-erect compact plant type, bold seeded (8.2 g/100 seeds).
4. **Pusa Arhar 2018-4:** Released for **NWPZ (Punjab, Delhi, Haryana,Western Uttar Pradesh)**. This variety is suitable for "Pigeonpea - wheat rotation" in NWPZ. This variety matures in 140-145 days and has got yield potential up to the tune of 23.06 q/ha. This variety has bolder seed size (mean 100 seed weight of 8.73 g) as compared to other released varieties for NWPZ.

5. Evidence of Success

Variety	Breeder seed indent (Qtls)		
	2019-20	**2020-21**	**2021-22**
Pusa Arhar 16	2.06	5.65	2.60

6. Problems Encountered and Resources Required

These varieties are released for NWPZ and Delhi NCT and states have a little tendency to promote their own released varieties. The FLDs and KVK support to popularize these varieties is required.