

# IARI BEST PRACTICE

## **1. Title of the Practice**

**VARIETIES OF CANOLA QUALITY INDIAN MUSTARD (*BRASSICA JUNCEA*) - FOR BETTER HUMAN HEALTH AND IMPROVED FARM INCOME**

## **2. Objectives of the Practice**

Rapeseed mustard is a traditional, indigenous and the most important edible oil crop in India. The presence of two anti-nutritional factors, erucic acid in seed oil and glucosinolates in seed meal cake, the nutritional value of rapeseed-mustard is continuously challenged by the health experts. To create value and improve the acceptance of rapeseed-mustard seed oil and meal, anti-nutritional factors such as erucic acid in oil and glucosinolates in the de-oiled cake need to be reduced through genetic options.

## **3. The Context**

The Rapeseed-mustard varieties fulfilling the requirements of low erucic acid (<2%) are called single zero, whereas, such varieties that also possess glucosinolate content < 30  $\mu\text{mol/g}$  in the oil-free meal are commonly called double zero or simply as “canola” type. With improved oil and seed meal quality (0/00) these products fetch a premium price in the domestic and international markets. These 0/00 varieties have a significant role in improving human health and farm income. Due to these factors, the quality mustard is being preferred by the consumers, traders, and thus, farmers.

Successful breeding of single zero varieties (‘0’; having erucic acid < 2% in oil) and double zero varieties (‘00’; possessing total glucosinolates < 30  $\mu\text{moles/g}$  in defatted seed meal) at IARI with good agronomic performance is expected to thwart the biggest challenge of enhancing the value of Indian mustard at an internationally accepted level. The sustained plant breeding efforts directed towards reduction in erucic acid and glucosinolates not only can make Indian mustard oil highly suitable for human consumption, but the cake/meal

obtained after extraction of oil (a rich source of protein) has also been made highly suitable for milk animals and poultry birds.

#### 4. The Practice

Breeding efforts have been underway in India since 1970 for reducing the erucic acid and glucosinolates to internationally accepted Canola standards. Thirty exotic single zero/canola lines including Zem-1 and Zem-2 of *B. juncea*; Torch, Tobin, Candle and Span of *B. rapa*; Tower, Altex and Westar of *B. napus* were introduced for testing in India. However, the introduced strains were not adaptable to Indian hot and dry growing conditions, therefore, initial efforts laid emphasis on the development of genetic stocks for low erucic acid and/or low glucosinolate in the indigenous cultivars using exotic donor sources. The zero erucic mustard developed by Kirk and Oram (1981) has been utilized by Indian scientists for transferring zero erucic traits to Indian mustard varieties. Australian and Chinese double low lines were used as donors for canola traits. These efforts led to the development and release of the first double low variety 'GSC-5' of *B. napus*, and the first low erucic acid variety 'Pusa Karishma' of *B. juncea* in 2003 and 2005, respectively. This first low erucic acid variety of Indian mustard has a limited preference among the farmers and traders due to its small seed size, though establishing a benchmark for the development of low erucic Indian mustard varieties with better productivity and market acceptability. Consistent efforts at ICAR-IARI, New Delhi has led to development of **two** double zero and **seven** single zero varieties of Indian mustard. The region-wise suitability and important traits of these varieties are presented below in the table 1.

**Table 1. Characteristic features of single zero and Canola varieties released from IARI, New Delhi**

Variety	Year of release	Avg. yield (q/ha)	Oil content (%)	Maturity (days)	1000 seed weight (g)	Recommended for
<b>Double zero/ Canola quality Indian mustard varieties</b>						
PDZM-33	2021	26.4	38	141	3.9	Zone II comprising of Rajasthan (Northern and Western parts), Punjab, Haryana, Delhi, Western UP, Plains of Jammu & Kashmir and Himachal Pradesh
PDZM-31	2017	23.3	41	142	3.68	Zone II comprising of Rajasthan (Northern and Western parts), Punjab, Haryana, Delhi, Western UP, Plains of Jammu & Kashmir and Himachal Pradesh
<b>Single zero Indian mustard varieties</b>						
PM-32	2020	27.1	38	145	4.61	Zone II comprising of Rajasthan (Northern and Western parts), Punjab, Haryana, Delhi, Western UP, Plains of Jammu & Kashmir and Himachal Pradesh
PM-30	2013	18.2	37.7	137	5.38	UP, Uttarakhand, MP and eastern Rajasthan
PM-29	2013	21.7	37.2	143	3.93	Delhi, Haryana, Jammu. Punjab and North Rajasthan
PM-24	2008	20.2	36.55	140	4.0	Delhi, Rajasthan, Punjab, Haryana, Plains of J&K and Western UP
PM-22	2008	20.7	36.0	142	3.6	NCR, Delhi
PM-21	2007	21.1	35.6	142	4.3	NWPZ or Zone II comprising of Rajasthan, Punjab, Haryana, Plains of Jammu & Kashmir, Delhi and Western UP.
	2008	18.60	35.6	133	4.3	Central Zone or Zone III (UP, Uttarakhand, Chhattisgarh and MP)
Pusa Karishma	2005	22.0	38	148	3.37	NCR, Delhi

## 5. Evidence of Success

Wider adaptability and superior agronomic performance of the newly developed 0/00 varieties have provided an opportunity to cultivate them under different agro-ecological zones of the country. Due to good agronomic performance, these varieties are now becoming popular among the farmers and traders, which is quite evident from the consistent increment in breeder seed indent and production over the years (Figure 1; Table 2). Furthermore, many private sector companies have come forward for their support in the commercialization of these 0/00 varieties. Addressing the challenges of Canola development with policy and technological interventions shall help in making India *Atmanirbhar* in edible oil production.

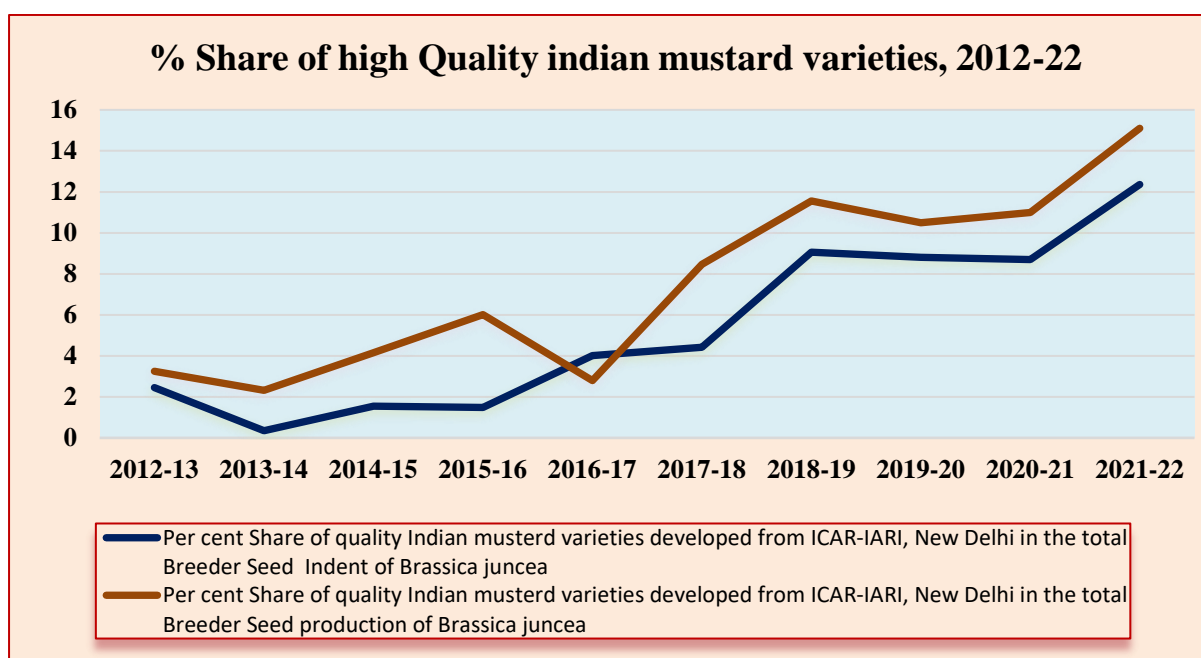


Figure 1: Share of Quality Indian Mustard Varieties in Total Breeder Seed Indent and Production of Indian Mustard

**Table 2: Breeder Seed Production (in quintals) of quality mustard varieties in the last 10 years**

Year		Pusa Mustard 21	Pusa Mustard 22	Pusa Mustard 24	Pusa Mustard 29	Pusa Mustard 30	Pusa Double Zero Mustard 31	Pusa Mustard 32	Pusa Double Zero Mustard 33	Total Breeder Seed Indented during the year of <i>B.</i> <i>juncea</i> varieties	Per cent share in the Breeder Seed Indent among the <i>B. juncea</i>
2012-13	Indent	0.50	0.20	1.75	0	0	0	0	0	84.10	2.91
	Production	0.52	1.25	1.48	0	0	0	0	0	145.54	2.23
2013-14	Indent	0.00	0.00	0	0.18	0.17	0	0	0	42.75	0.81
	Production	0.33	1.09	0	0.40	0.50	0	0	0	128.70	1.80
2014-15	Indent	0	0	1.00	0.27	0.27	0	0	0	98.46	1.56
	Production	0	0	1.58	0.27	2.30	0	0	0	180.54	2.29
2015-16	Indent	0	0	1.00	0.07	0.41	0	0	0	73.05	2.02
	Production	0	0	2.10	0.10	3.82	0	0	0	231.17	2.60
2016-17	Indent	0	0	1.20	1.13	1.69	0	0	0	65.33	6.15
	Production	0	0	0.80	0	2.00	0	0	0	148.17	1.88
2017-18	Indent	0	0.02	1.50	0	2.50	0.40	0	0	61.33	7.20
	Production	0	0.96	1.60	0	5.00	0.90	0	0	176.53	4.79
2018-19	Indent	0	0	2.0	0	6.40	0.65	0	0	57.58	15.71
	Production	0	0	3.15	0	6.40	2.00	0	0	151.93	7.60
2019-20	Indent	0	0	0	0	6.81	2.00	0	0	57.62	15.28
	Production	0	0	0	0	7.00	3.50	0	0	175.06	5.99
2020-21	Indent	0	0	0	0	3.30	5.00	0.40	0	66.60	13.06
	Production	0	0	0	0	5.00	5.50	0.50	0	133.11	8.26
2021-22	Indent	0	0	0	0	6.40	4.91	1.05	0.00	68.30	18.09
	Production	0	0	0	0	8.00	5.00	1.10	1.00	68.26	22.12

## **6. Problems Encountered and Resources Required**

- Despite the acceptance of these 0/00 Indian mustard varieties by the farmers based on their on-farm performance, there is no segregation of the produce in the Indian grain markets. Thus, devoid farmers from getting an additional premium for high-quality produce. Therefore, a dedicated niche for cultivation needs to be defined and buy-back arrangements by public or private sector agencies need to be taken up for translating the benefits to the society
- Indian mustard happenstances up to 18 per cent out crossing, thus, challenging the quality of the seed. Therefore, seed production technology of these varieties needs to be revisited and re-defined keeping quality of seed and produce in background.
- Breeding of quality mustard varieties, being a continuous process, requires special arrangements at the farm and very expensive state of the art dedicated laboratory facilities. Thus, to provide health benefits and improve the income of the farmers by making high quality indigenous mustard available to them, a special monitory grant needs to be infused continuously.