

M<sub>1</sub> (1995):

- Selection of materials for irradiation (ILC 482, FLIP 82-259C and FLIP 83-47C are resistant to ascochyta blight, but Ispanyol and Urkutlu landrace possess specific adaptation trait)
- Selection of doses (100, 200, 300, 400 and 500 Gy of gamma rays)
- Irradiation and growing M<sub>1</sub> with parents as control in April 1995
- Harvesting M<sub>1</sub> as single plant

M<sub>2</sub> (1996):

- Growing M<sub>2</sub> in spring with parents and checks and free from the target stresses
- Selecting all deviating types in any recordable characters as potential mutant

M<sub>3</sub> (1996):

- Screening for cold tolerance after winter and screening for resistance to ascochyta blight prior to podding stage in M<sub>3</sub>, sown in early autumn with the respective parents and checks
- Including susceptible checks in the nursery for both stresses
- Scoring the reaction of mutants after the susceptible checks were killed
- Reconfirming the resistant mutants in the following generations

The number of days with freezing temperatures in October, November, December, January, February and March were recorded as 3, 0, 4, 17, 20 and 18, respectively. The lowest temperature in the middle of February in 1997 was -12.1°C. While susceptible mutants were generally killed due to cold damage, the mutants 2200210, 2200286, 2300011, 2400106, 2400107, 3500016, 4200230 and 5200132 were identified as cold tolerant (Table 1). The cold tolerant lines were also resistant to ascochyta blight under field conditions. Besides morphologically different types, tall, erect and late-maturing types were especially selected, since most of the lines that showed resistance to ascochyta blight had these traits (Singh and Reddy 1991). Similarly, Haq and Singh (1994) designed a mutation-breeding program and successfully selected a cold tolerant and ascochyta blight resistant line, M 16119, for the first time. This mutant was also very late-maturing type. Our results have clearly suggested that mutation techniques can be effectively

used in inducing complex traits that inherited quantitatively such as cold tolerance and ascochyta blight in chickpea.

## References

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## JGK 1: A New Large-seeded, Short-duration, High-yielding Kabuli Chickpea Variety for Central India

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India accounts for over 60% of global chickpea (*Cicer arietinum*) production and more than half of it comes from the Central Zone (CZ) that includes the states of Madhya Pradesh, Maharashtra and Gujarat and small portions of Rajasthan, Uttar Pradesh, Chhattisgarh and Andhra Pradesh. The chickpea cultivars grown in the CZ are predominantly desi type. The increasing demand of kabuli chickpea in the market and availability of short-duration kabuli chickpea varieties have attracted farmers of the CZ to grow kabuli chickpea in recent years. Kabuli chickpea fetches 50 to 100% higher price than desi types depending on seed size. There is now an increasing preference for large-seeded (100-seed mass >30 g) kabuli

chickpeas in India. Until recently, no kabuli chickpea variety having large seed size (100-seed mass >25 g) was available in the CZ. Thus, in kabuli chickpea breeding the major emphasis has been on development of large-seeded, short-duration varieties. The first large-seeded kabuli chickpea variety released for the CZ is PKV Kabuli 2 (KAK 2) in 2000 (Zope et al. 2002). This report describes another such variety released recently as JGK 1 (Jawahar Gram Kabuli 1).

JGK 1 was derived from a three-way cross [(ICCV 2 × Surutato 77) × ICC 7344] made at ICRISAT, Patancheru, India during the 1987/88 season. Among parents, ICCV 2 is an extra-early (85–90 days), medium-seeded (100-seed mass 25 g), high-yielding popular kabuli variety, which is resistant to fusarium wilt and is grown widely in southern and central India, Myanmar and Sudan. Surutato 77 and ICC 7344 (Angostura) are extra large-seeded (100-seed mass >50 g) kabuli germplasm lines from Mexico.

JGK 1 was entered as JKG 92337 by the Jawaharlal Nehru Agricultural University, Jabalpur, Madhya Pradesh in the trials of All India Coordinated Research Project on Chickpea (AICRPC) and tested in the CZ for three years - Initial Varietal Trial (IVT) 1999–2000, Advanced Varietal Trial-I (AVT-I) 2000–01 and Advanced Varietal Trial-II (AVT-II) 2001–02. On an average, it gave 9.5% higher yield over the check L 550, 20.0% over ICCV 2, 13.6% over BG 1003 and 31.6% over KAK 2 (Table 1). JKG 92337 has large (100-seed mass 31.8 g) and attractive seeds (Fig. 1 and Table 1).

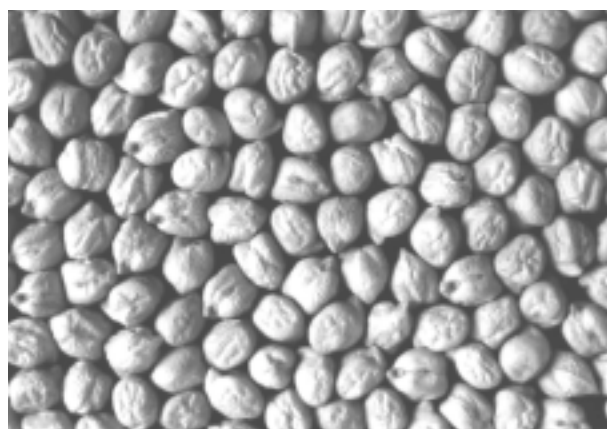
JKG 92337 is a short-duration variety maturing in 109 to 119 days, with an average of 114 days (Table 1). Short-duration chickpea varieties are needed in the CZ as the crop is generally grown under rainfed condition on

residual moisture and the long-duration varieties circumvent to terminal drought. On an average, JKG 92337 took only 5 days more than ICCV 2 to mature. It matured 10 days earlier than L 550, 2 days earlier than BG 1003 and 5 days earlier than KAK 2.

Fusarium wilt is one of the most important diseases of chickpea in the CZ. JKG 92337 was tested along with checks L 550, BG 1003 and KAK 2 for resistance to this disease at 13 locations during 2000/01 and at 9 locations during 2001/02 under pathological trials of AICRPC. Though none of the varieties was resistant at all the locations, JKG 92337 was found resistant (<20% mortality) at more number of locations as compared to other varieties during 2000/01 (Table 1). However, during 2001/02 season all varieties had similar wilt reaction.

Pod borer (*Helicoverpa* sp) is the most important insect pest of chickpea. JKG 92337 was tested along with the checks L 550, BG 1003 and KAK 2 for resistance to pod borer at 6 locations during 2000/01 and at 4 locations during 2001/02 in entomological trials of AICRPC. On an average, only 13.8% pods were damaged in JKG 92337 as compared to 15.7 to 18.3% in other varieties (Table 1).

Based on its superior performance over KAK 2, JKG 92337 was identified for release in CZ by the Variety Identification Committee during the Annual Group Meet of AICRPC held at CCS Harayna Agricultural University, Hisar, India during September 2002. It was later released and notified by the Central Sub-Committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops in its meeting held on 13 December 2002. The variety has been registered with the National Bureau of Plant Genetic Resources, New Delhi, India under the number IC 296329.



**Figure 1.** Kabuli chickpea variety JGK 1 (JKG 92337) released in central India: (left) a typical plant; and (right) large seeds.

**Table 1. Yield performance and other characteristics of JKG 92337 (JKG 1) in comparison to check varieties in various All India Coordinated Trials conducted in the Central Zone of India during 1999–2002.**

Trials <sup>1</sup>	JKG 92337	L 550	ICCV 2	BG 1003	KAK 2
<b>Yield (kg ha<sup>-1</sup>)</b>					
IVT 1999–2000	1918 (6) <sup>2</sup>	1668 (5)	1597 (6)	1769 (6)	–
AVT-I 2000–01	1518 (6)	1353 (5)	–	1294 (6)	1192 (6)
AVT-II 2001–02	1502 (5)	–	1118 (5)	1275 (5)	1335 (5)
Weighted average	1655	1511	1379	1456	1257
Increase (%) in yield of JKG 92337 over check	–	9.5	20.0	13.6	31.6
<b>100-seed mass (g)</b>					
IVT 1999–2000	28.7 (6)	19.8 (6)	23.5 (6)	24.4 (6)	–
AVT-I 2000–01	32.7 (6)	20.4 (5)	–	24.0 (6)	35.3 (6)
AVT-II 2001–02	34.0 (6)	–	21.6 (6)	22.3 (6)	36.4 (6)
Weighted average	31.8	20.1	22.6	23.6	35.8
<b>Maturity duration (days)</b>					
IVT 1999–2000	109 (6)	123 (5)	104 (6)	118 (6)	–
AVT-I 2000–01	119 (6)	125 (5)	–	108 (6)	120 (6)
AVT-II 2001–02	115 (6)	–	114 (6)	122 (6)	117 (6)
Weighted average	114	124	109	116	119
<b>Fusarium wilt resistance at locations<sup>3</sup> (number)</b>					
AVT-I 2000–01	8 (13)	2 (13)	–	4 (13)	5 (12)
AVT-II 2001–02	2 (9)	–	–	2 (9)	3 (9)
Total	10 (22)	2 (13)	–	6 (16)	8 (21)
<b>Pod damage (%) due to pod borer</b>					
AVT-I 2000–01	14.8 (6)	17.6 (6)	–	17.0 (6)	21.0 (6)
AVT-II 2001–02	12.3 (4)	15.3 (4)	–	13.7 (4)	14.3 (4)
Weighted average	13.8	16.7	–	15.7	18.3

1. IVT = Initial Varietal Trial; AVT = Advanced Varietal Trial.

2. Figures in parentheses indicate number of locations tested.

3. Number of locations where the variety was resistant or moderately resistant (<20% plant mortality).

## Reference

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## PBG 5: A New Multiple Disease Resistant Desi Chickpea Variety for Punjab, India

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The sub-montaneous tract adjoining the states of Himachal Pradesh, Jammu and Kashmir and Punjab in India and Punjab province in Pakistan is relatively more humid and prone to foliar diseases of chickpea (*Cicer arietinum*), particularly ascochyta blight (AB) (*Ascochyta rabiei*) and botrytis gray mold (*Botrytis cinerea*).