



(57 000 plants) 3 male sterile mutants were obtained. After an allelic test the genes responsible for male sterility were denoted as *ms-6*, *ms-7*, and *ms-8*. After many years of testing various male sterile sources the gene *ms-8* proved to be the most suitable for hybrid seed production because it determines 100% male sterility, independent of the climatic condition or the genotype. The mutation causes the highest reduction of anthers, which allows easy distinction between male sterile and fertile flowers. The development of the mutant male sterile line Zlaten medal *ms-8* is a good example of how mutation techniques can be very useful for adding or changing only one trait without altering the basic genotype.

The male parent line 'GO-250B' was developed at the Vegetable Research Station at G. Oriahoviza and is characterized by a good combining ability and many outstanding agronomic traits. The new hybrid variety 'Gornooriahovska kapia F₁' is suitable for early and middle early field production as well as for cultivation under plastic or glasshouses (Table 1). The vegetation period from emergence to maturity is approximately 105 days. The heterotic plants are 60-70 cm high and lodging resistant. The fruits are big, long (14-18 cm), "kapia" type, two to three lobbed, 70-90 g, with tender and tasty flesh (4.5-5.5 mm thickness of the pericarp), 9-10% dry matter, 220-250 mg% vitamin C, 4.5 % sugars. The immature fruits are green and the mature ones – dark red. The variety is resistant to TMV and possesses high field resistance to *Verticillium* and CMV. Hybrid seed production will be performed according to the techniques described by Daskalov [2].

Table 1. Performance of Gornooriahovska kapia F₁ variety under field and plastic house conditions

Variants	Early yield kg/ha				Total yield kg/ha			
	1993	1994	Average	(%)	1993	1994	Average	(%)
Field								
Albena (check)	18440	32490	25640	100.00	36880	41020	38950	100.00
G. kapia*	37500	31740	34620	135.02	73870	60490	67180	172.47
Plastic house								
Albena (check)	42340	23610	32970	100.00	8280	50960	66880	100.00
G. kapia	51000	34500	42750	129.66	10386	59760	81810	122.32

*The hybrid variety 'Gornooriahovska kapia F₁' was developed by T. Hristov, S. Daskalov, L. Milkova and E. Stoimenova.

REFERENCES

- [1] Daskalov, S., 1973. Investigations of induced mutants in *Capsicum annuum* L. III. Mutants in the variety Zlaten medal. Genet.Plant Breed. 6: 419-429 [in Bulgarian with English summary].
- [2] Daskalov, S., 1976. Seed setting of male sterile mutants in connection with heterosis breeding in pepper (*C. annuum* L.). Genet.Agr. 30: 407-417.

(Contributed by DASKALOV, S., Institute of Genetics "Prof. D. Kostoff", Bulgarian Academy of Science, Sofia 1113, Bulgaria)

'CM 88' – A MULTIPLE DISEASE RESISTANT CHICKPEA MUTANT VARIETY

Chickpea is the most important grain legume crop of Pakistan. *Ascochyta* blight (*Ascochyta rabiei*) and *Fusarium* wilt (*Fusarium oxysporum* F. sp *cicer*) are most serious diseases, having the potential to devastate a crop [1]. A multiple disease resistant and high yielding mutant CM 88 has been developed through 100 Gy gamma irradiation treatment of



variety 'C 727'. This was once a widely grown and popular variety, which lost its resistance to *Ascochyta* and was replaced. The selection of mutants was performed in the M_2 generation grown in the *Ascochyta* blight nursery and sixteen mutants were selected [2]. In the subsequent generations CM 88 proved resistant to both *Ascochyta* blight and *Fusarium* wilt, and exhibited superiority in agronomic characteristics. CM 88 was also tested for many years in the various yield trials on research stations and farmers fields throughout the country. In these trials it out yielded both the parent and standard varieties [3]. The mutant CM 88 has been approved by the Punjab Seed Council on 27 October 1994 for general cultivation in the Punjab Province, especially the Thal area which accounts for more than 70% of the area under chickpea cultivation.

REFERENCES

- [1] Haq, M. A. and M. Hassan, 1980. Induced mutants for resistance to *Ascochyta* blight in chickpea. *Pak.J.Agric.Sci.* **17**(3-4): 57-64.
- [2] Haq, M. A., M. Sadiq, and M. Hassan, 1983. Induction of resistance to *Ascochyta* blight in chickpea through induced mutations. In: *Disease Resistance in Crop Plants II*. IAEA, Vienna. pp.171-181.
- [3] Haq, M. A., M. Sadiq, and M. Hassan, 1988. Improvement of chickpea through induced mutations. In: *Improvement of Grain Legume Production Using Induced Mutations*. IAEA, Vienna. pp.75-88.

(Contributed by **M.A. HAQ, MAHMUDUL HASSAN and M. SADIQ**, Nuclear Institute for Agriculture and Biology, Faisalabad, Pakistan)

A HIGH YIELDING, BETTER QUALITY CHICKPEA MUTANT VARIETY 'NIFA-95'

Chickpea or gram (*Cicer arietinum* L.) is an important legume crop of Pakistan, grown on over one million hectares annually. The national average yield of the crop is very low (0.5 t/ha) and thus the country had to spent about 2 billion rupees (\$ 50 million) on import of pulses. The main causes of low yield are non-availability of genetic sources for resistance to various diseases especially gram blight *Ascochyta rabiei* (Pass.) Lab., insect pest (Pod borer) and non-adoption of proper production technology by the farmers. This calls for earnest efforts of breeders to evolve high yielding and disease resistant varieties of chickpea for provision of quality seeds to the farming community to increase production of this important crop.

Seeds of a highly blight susceptible variety '6153' were irradiated at 200 Gy dose of gamma radiation in 1985 and the promising mutant line CMN-446-4 was selected in M_3 generation on the basis of disease resistance, greater number of pods and better plant type. After confirmation of its resistance to blight in M_4 and M_5 , the mutant line was evaluated in various trials at different locations. In the advanced and zonal yield trials during 1993-95, the line CMN-446-4 produced the highest grain yield of 2,600 kg/ha as compared to the rest of the mutants and varieties. The line was also evaluated in the chickpea national uniform yield trial, conducted on over 11 locations in the country during 1993-94. In this trial, the mutant line ranked 3rd by producing an average yield of 1,528 kg/ha as compared to the two check varieties 'Punjab-91' (1,316 kg/ha) and 'Paidar-91' (1,391 kg/ha). The mutant line CMN-446-4 is moderately resistant to gram blight, highly resistant to stored pest (pulse beetle), contains 25.3% more protein as compared to the parental variety 6153 and is also better in nitrogen fixing capacity.