'Karima-1': Dry Pea Cultivar for Canning in the Sudan

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Additional index words. *Pisum sativum*, vegetable breeding, *Erysiphe polygoni*

In Sudan, dry peas (*Pisum sativum* L.) are produced in the northern state, predominantly as a winter crop, from November to February. Production for canning is expanding to cover the needs of two canning plants (Nourai et al., 1983). The canning industry was confined to using local types that are late, heterogeneous, and low yielding. The two introduced American cultivars Alaska and Nome, recommended by the Agricultural Research Corporation, are high in quality but are low yielding. Thus, a breeding program was initiated to develop high-yielding genotypes that possess acceptable processing quality.

A breeding selection program was initiated from 1978 to 1979 at Hudeiba Research Station (lat. 17°34' N, long. 33°56' E; 350-m elevation) in the northern region of Sudan. The soils at Hudeiba are aridsols, heavy-textured, calcareous, alkaline old soils that crack easily due to their appreciable mortmorillonitic clay content. They are low in organic matter and relatively poor in N. The climate is tropical and arid, but it is relatively cool in winter from November to February, with day/night means of 32/15C and 11.0 to 11.5 h of daylength. Rainfall (0 to 200 mm) occurs mainly between July and September.

Origin

In 1974, a dry-pea germplasm collection with 580 entries was received from the International Center for Agricultural Research in the Dry Areas (ICARDA), Aleppo, Syria. Initial screening, performed in two seasons (1978–79 and 1979–80), resulted in the elimination of 520 entries because they were either maladapted to the local environment, susceptible to powdery mildew (*Erysiphe polygoni* DC), or of poor seed quality. The standard single plant selection approach (pedigree method) was followed to eliminate within-entry variability and select high-yielding lines with acceptable canning qualities. Four generations of selection were necessary to obtain pure lines (1982–83 season).

'Karima-1' was developed as an F₄ selection from entry 590 (590 was the number given

by ICARDA), which is a local Syrian-type variable in seed size, color, and shape. It was carried as a bulk line though F₆ and officially released to the canning industry in Sudan in 1989 (Mohamedali, 1989) (Fig. 1).

Tests for yield and canning qualities. Breeding lines were assessed for seed yield and canning qualities for four seasons (1986 to 1990) using the American cultivars Alaska and Nome as controls; both cultivars generally are suited for canning. Quality assessment included percentage of nonsoakers (NS) after 12-h soaking in tap water, hydration coefficient (HC; weight of seeds after 12-h soaking ÷ weight of seeds before soaking × 100), percent increase in weight after processing (IWP) compared to that after 12-h soaking, time for processing (TP), and protein percentage as determined by the Kjeldahl method.

'Karima-1' was consistently high yielding, having a seed yield advantage ranging from 174% to 594% over 'Alaska' (Table 1). The high-yielding capacity of 'Karima-1' is derived primarily from the many pods produced per plant, averaging 14 for 'Karima-1' vs. seven for 'Alaska'. Seed yield had a significant positive correlation with the number of pods produced per plant ($r=0.72$). 'Karima-1' may be more adapted to the relatively high temperatures during the growing season than 'Alaska' and 'Nome'; it has a higher harvest index, lower NS, and a higher HC and IWP

compared to either 'Alaska' or 'Nome'. Its protein content and time needed for processing are similar to those of 'Alaska' and 'Nome' (Tables 1 and 2).

Description

The 'Karima-1' plant has a tall (60 to 80 cm), indeterminate, dark-green vine. Growth is vigorous with standard leaf size and morphology. The leaf is acute (45°), and the cultivar has a basal kind of branching beginning 3 to 5 cm above the ground. Flowers are white. The cultivar needs 37, 44, and 94 days to flower, pod, and mature, respectively, when planted during the third week of November on ridges 60 cm apart, seeds sown in two rows per ridge in hills 10 cm apart, each with three plants.

Pods are dark green, with blunt edges and are produced individually at each node. Average pod length is 8 ± 2 cm, and width is 1.5 ± 0.2 cm. An average of eight to 18 pods are produced per plant, with each pod containing four to five seeds. The 1000-seed weight is 195 ± 20 g. Seeds are large, wrinkled, green, and assume a uniform green, large, smooth shape after processing (John Innes Institute, 1986).

Availability

'Karima-1' seeds can be requested from G.H.M. for experimental purposes. For commercial-size lots, contact the Director General, Agricultural Research Corporation, WadMedani, Sudan.

Literature Cited

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Fig. 1. Pedigree of 'Karima-1'.

Table 1. Comparison of 'Karima-1' with 'Alaska' and 'Nome' for yield at Hudeiba, Sudan, from 1986–87 to 1989–90.

Entry	Yield (t·ha ⁻¹)				Harvest index (%) ^z
	Season				
	1986–87	1987–88	1988–89	1989–90	
Karima-1	3.44 (174) ^y	1.50 (250)	2.89 (185)	1.01(594)	52
Alaska	1.98	0.60	1.56	0.17	37
Nome	1.77 (89)	0.50 (83)	1.61 (103)	0.19 (112)	38
LSD _(0.05) ^x	0.85	0.60	0.79	0.41	5

^xHarvest index = [seed yield/biological yield (seed + straw)] × 100; measured at harvest.

^yNumbers in parentheses are yields as percentage of the 'Alaska' control.

^zEach mean is based on four replications.

Table 2. Comparison of 'Karima-1' with 'Alaska' and 'Nome' for canning qualities at Hudeiba, Sudan, from 1986–87 to 1989–90.

Entry	Nonsoakers (%)	Hydration coefficient (%)	Wt increase after processing (%)	Time for processing (min)	Protein (%)
Karima-1	9	251	37	15	24.6
Alaska	12	213	14	13	25.4
Nome	12	221	13	14	25.9
LSD(0.05) ^z	7	14	11	3	1.2

^zEach mean is based on six replications.

Received for publication 12 July 1993. Accepted for publication 23 Apr. 1994. This research was funded by Agricultural Research Corp.; International Development Research Center, Canada; and International Fund for Agricultural Development. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

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