African Journal of Biotechnology Vol. 7 (7), pp. 904-906, 3 April, 2008
Available online at http://www.academicjournals.org/AJB
DOI: 10.5897/AJB07.694
ISSN 1684–5315 © 2008 Academic Journals

Short Communication

Inheritance of characters in kenaf (*Hibiscus cannabinus*)

Falusi O.A

Department of Biological Sciences, Federal University of Technology, Minna, Niger State, Nigeria.
E-mail: drfalusi@yahoo.com.

Accepted 25 January, 2008

This investigation was carried out to study the inheritance pattern in intraspecific crosses involving two local varieties of *Hibiscus cannabinus* L. One variety has pink flowers and resistance to root knot nematode, while the other variety has light yellow flowers but susceptible to root knot nematode. Results show that the inheritance of pink flowers and resistance to root knot nematode was controlled by two independently assorting genes with both dominant alleles 'P' and 'R' producing plants having pink flowers and resistant to root knot nematode, while their recessive alleles 'p' and 'r' produced plants having light-yellow flowers and susceptible to root knot nematode, respectively.

Key words: *Hibiscus cannabinus* L., intra- specific crosses, root knot nematode.

INTRODUCTION

Hibiscus cannabinus L. also known as kenaf, is one of the most important species of Hibiscus in Nigeria (Falusi, 2004). It is widely cultivated in West Africa, Bangladesh, India and Southern China (David and Adam, 1988). The plant belongs to the order Malvales, the family Malvaceae and the genus *Hibiscus* (Olubukola and Illoh, 1996). It is an annual herbaceous upright plant, which can grow up to 3 m and usually cultivated for vegetables or fibre. The flowers may be creamy white, pink, light-yellow or bright yellow depending on the variety. Matured kenaf plants are distinguished by the presence of small prickly hairs on the stem (Schippers, 2000).

In Nigeria, the pink flowered variety and the light-yellow flowered variety are sometimes used to mark farm boundaries or planted as kitchen garden crops (Seck, 1997). These two varieties exhibit different characteristics. Few of these differences have however, been genetically investigated. Wilson and Menzel (1967) reported that the inheritance of resistance to root knot nematode in Hibiscus species was monogenic. I have also reported further monogenic inheritance of stem pigmentation in varieties of *Hibiscus sabdariffa* (Falusi, 2005). This paper is a further report on the mode of inheritance of resistance to root knot nematode from intra- specific crosses. It also throws some light on the role of gene mutation on the development of character differences and the possibility of using the characters as marker genes in identifying true F1 hybrids.

MATERIALS AND METHODS

The experimental materials were obtained from parts of central and North-western Nigeria (Falusi, 2004). They were identified by the morphological description of Hutchinson and Dalziel (1963), Schippers (2000) and Mann et al. (2003). The varieties in relation to the character studied are as follows:

NRG-NG-R5: Pink flowers with resistance to root knot nematodes, and
NRG-NG-R6: Light-yellow flowers and susceptible to root knot nematode.

To confirm that they were homozygous, a green house evaluation was done and no segregation was observed. The seedlings of each variety were raised in plastic buckets containing sandy loam soil. At maturity, crosses were made between the two varieties using flower buds emasculated just before anthesis and pollinated the second day with pollen grains from freshly dehisced anthers of the male parent. The F_1 seeds were planted and the resulting plants were naturally self pollinated while some were backcrossed to both parents. The F_2 and backcross populations were grown along with susceptible parent plants (as control and for comparison). These plants were exposed to root knot nematode infection after Wilson and Menzel (1967). The segregating seedlings were counted to determine the inheritance of the different characters under investigation. Chi-square tests were used to compare the observed and theoretical ratio.

Figures 1. Shoots of two local varieties of *Hibiscus cannabinus* and their Hybrid. **1**: Shoot of the variety with pink flowers showing resistance to root knot nematode. **2**: Shoot of the hybrid plant showing pink flowers and resistance to root knot nematode. **3**: Shoot of the variety with light-yellow flowers showing effect of root knot nematode (arrow).

Table 1. Inheritance of pink flowers and resistance to root knot nematodes in two local varieties of *hibiscus cannabinus* l

Cross	Experimental				Theoretical				X^2	P	Ratio
	PR	Pr	pR	pr	PR	Pr	pR	pr			
NRG-NR5 x NRG-NG-R6 (Selfed)	73	32	26	11	79.875	26.625	26.625	8.875	2.20	0.90 - 0.80	9:3:3:1
NRG-NG-R5 x NRG-NG-R6 x NRG-NG-R5	36	0	0	0	36	0	0	0	0	0.00	All P and R
NRG-NG-R5 x NRG-NG-R6 x NRG-NG-R6	8	7	5	4	6	6	6	6	1.67	0.70 - 0.50	1:1:1:1

P = Pink flowers.
R = resistance to root knot nematode.
P = Light-yellow flowers.
R = Susceptible to root knot nematode.

RESULTS AND DISCUSSION

All the F_1 plants from the crosses between the two varieties of *H. cannabinus* were all having pink flowers and resistant to root knot nematode (Figure 1). The F_2 and backcross data from the crosses were presented in Table 1. When the F_1 plants were backcrossed, to the pink flowered parent, all the progenies produced had pink flowers and resistance to root knot nematode. The backcross progenies of the F_1 to the light-yellow flowered parents however, produced phenotypic ratio of 1 pink flowered and resistance to root knot nematode, to 1 pink flowered and susceptible to root knot nematode, to 1 light- yellow flowered and resistance to root knot nematode, to 1 light-yellow flowered and susceptible to root knot nematode plants.

The F2 plants in the crosses segregated in approximate ratios of 9 pink flower and resistance to root knot nematode, to 3 pink flower and susceptible to root knot nematode, to 3 light-yellow flower and resistance to root knot nematode, to 1 light-yellow flower and susceptible to root knot nematode plants. The chi-square values obtained for the crosses, showed a good fit for a digenic inheritance for an F_2 phenotypic ratio of 9:3:3:1. This was confirmed in the phenotypes of the backcross progenies of either, 1:1:1:1 when the F_1 was crossed to the recessive parent or pink flowered and resistant plants, when the F1 was crossed to the dominant parent.

These results suggest that the expression of pink flowers and resistance to root knot nematode was due to the presence of both pairs of the dominant alleles (P—R-) while the presence of one (P-rr or ppR-) produced either pink flowered or resistance to root knot nematode. This is an indication that character differences between the two local varieties of *H. cannabinus* L. was simply inherited. Thus the adaptive characteristics by which both varieties

are distinguished are controlled by a small number of genes with marked phenotypic effects.

By representing the genotypes of the light-yellow flowered variety by (pprr) and the pink flowered variety by (PPRR), the change from the pink flowered form to the light-yellow flowered plant form could have been caused by the mutation of P → p and R→ r. A similar digenic inheritance with complementary action was reported for the expression of hairiness of stem in the cross between *Sesamum indicum* and *Ceratotheca sesamoides* (Falusi et al., 2002). Because of the easily observable and simple inheritance nature of these two characters, they could be advantageously used as marker genes to identify true F1 hybrids.

REFERENCES

David G, Adam P (1988). Crops of the drier regions of the Tropics. ELBS Edt.

Falusi OA (2005).Inheritance of stem pigmentation in two local varieties of Hibiscus sabdariffa Niger. J. Arid Agric.(In press)

Falusi OA (2004). Collecting Roselle germplasm in Nigeria. J. Arid Agric. 14: pp. 81-83

Falusi OA, Salako EA, Funmi FM (2002). Inheritance of Hairiness of stem and petide in a selection from local (Nigerian) germplasm of Sesame.Tropicultura, 20(3): 156-158.

Hutchinson J, Dalziel JM (1963). Floral of west tropical Africa II crown agents, London.

Mann A, Gbate M, Umar N (2003). Medicinal and economic plants of Nupeland. Juber evans Bida, Nigeria p. 151.

Olubukola A, Illoh HC (1996). Pollen grain Morphology of some species of *Hibiscus*. Niger. J. Bot. 9: 9-14.

Schippers RR (2000). African indigenous vegetables. An overview of the cultivated species. Chathan. UK. Natural Resources Institute /A.C.P-EU Technical centre for Agriculture and rural cooperation, pp. 122-133.

Seck A (1997). Seed production and storage of indigenous vegetables. In *Workshop proceedings NRI African Indigenous vegetables workshop*, Limbe, Cameroon, January, 1997. Schippers RR, Budd L (eds). Chathan, UK: Natural Resources Institute. pp. 81-87.

Wilson ED, Menzel MY (1967). Inter specific hybrids between Kenaf (*Hibiscus cannabinus*) and Roselle (*Hibiscus sabdariffa*). Euphytica, 16: 3.