

Identification of Natural Sources of Resistance to Powdery Mildew, Zucchini yellow mosaic virus (ZYMV) and Fruit Flies Infestation in the Indigenous Pumpkin (*Cucurbita moschata*) Germplasm

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Introduction

Pumpkin (*Cucurbita moschata*) is ranked as one of the least economic important vegetable crops in Sudan despite having high nutritive values and great industrial uses. It is grown in small holdings along rivers banks. The crop is threatened by damage caused by powdery mildew, Zucchini yellow mosaic virus (Sid Ahmed *et al.*, 2003) and fruit flies (Gesmall, 2000). The main objective of this study is to obtain natural sources of resistance to powdery mildew, ZYMV and/or fruit flies infestation among the indigenous pumpkin germplasm.

Materials and Methods

This project was started with surveys and collection missions in Gezira, Kassala, Gedarif and Sinnar states, since rainfall season of 2008. One hundred and twenty three accessions were collected in the surveyed fields and markets. Then, the collected accessions were grown at the University of Gezira research farm in winter season of 2008-09. Thirty plants of each accession were planted in a randomized complete block design (RCBD), with three replications. Each plant was screened for powdery mildew and zucchini yellow mosaic virus (ZYMV) and fruit flies infestation. Two selected accessions were subjected to three cycles of purification to obtain uniform lines during rainfall season 2009, winter season 2009-010 and rainfall season 2010. At the end of field experimentation; the two accessions were subjected to proximate analysis.

Results and Discussion

Field surveys showed the great threat to pumpkin production caused by powdery mildew, ZYMV and fruit

flies infestation in the different states. Reduction in yield was estimated to be 10-20% for powdery mildew (PM), 25% for ZYMV and 45-55% for fruit flies (FFs). Results of screening the collected germplasm during winter 2008-09 for resistance to PM, ZYMV and FFs are given in Table 1. It was found that resistance against powdery mildew, ZYMV and fruit flies was not common among the indigenous Sudanese cultivated pumpkin with only eight, five and three accessions segregating for resistance to PM, ZYMV and FFs, respectively, and one uniform accession for ZYMV resistance. Results also indicated that only one accession (UG 002) which was collected in ElShowak area, Eastern Sudan, showed resistance to PM, ZYMV and FFs. While another accession (UG 042), which was collected in El-Haj Abdalla, 40 km south of Medani, showed resistance to powdery mildew and fruit flies while susceptible to ZYMV infection. The general characteristics and percentage of resistance for PM, ZYMV and FFs of UG 002 and UG 042 are given in table 2 and 3, respectively. Results of screening UG 012 and UG 042 plants in the three cycles of purification concluded that resistance against PM, ZYMV and FFs were independent and simply inherited (Table 4). Results encourage more efforts to be exerted in the breeding project to obtain homozygous resistant lines with known genetics of resistance. The proximate analysis of the line UG 012 is presented in Table 5. It was rich in energy, carbohydrates, protein and fiber contents and comparable to pumpkin cultivars used commercially worldwide. The collected accessions with complete passport data are being prepared to be conserved at the Plant Genetic Resource Unit of the Agricultural Research Corporation at Wad Medani Research Station.

Acknowledgements

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Literature Cited

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2. Gesmallah, A.E. (2000). Breeding Melon (*Cucumis melo* L.) Resistance to the Lesser Melon Fruit Fly *Dacus ciliatus* LW. M. Sc. Thesis, University of Gezira, Wad Medani, Sudan.

Table 1. General evaluation of the collected accessions against powdery mildew, ZYMV and fruit flies

Total number of accessions	Powdery mildew resistant accessions		ZYMV resistant accessions		Fruit flies resistant accessions	
	Uniform	segregating	uniform	Segregating	Uniform	Segregating
123	-	8	1	5	-	3

Note: Number of screened plants of each accession was 30 plants.

Table 2. General characteristics of the promising accessions UG 002 and UG 042

Accession	Plant canopy	Number of fruits/plant	Fruit size	Fruit out skin color	Rind thickness	Cavity size	Flesh colour
UG 002	medium	8-10	large	Uniform light brown	medium	small	orange
UG 042	large	12-16	Medium to small	Striped green with light green	thin	large	yellow

Table 3. Percentage of resistance for powdery mildew, ZYMV and fruit flies in the two accessions UG 012 and UG 042

Accession number*	Powdery mildew	ZYMV	Fruit flies	Percentage of plants with combined resistance
UG 012	65%	68%	27%	7%, only two plants were selected
UG 042	43%	-	18%	13%, only four plants were selected

Table 4. Progress of resistance (in percentage) against powdery mildew, ZYMV and fruit flies in the pedigree of UG 012 and UG 042

Accession	UG012			UG 042	
	Powdery mildew	ZYMV	Fruit flies	Powdery mildew	Fruit flies
First season	73	68	71.5	53.7	34
Second season	85	87	76	66	39
Third season	94	93	85	79	57.3

Table 5. Proximate analysis of flesh of the line UG012

Content	
Moisture %	92.1
Kcals/100gm	
Calories content	25.5
Content in gm/100g	
Protein content	1.05
Fat content	0.12
Ash	0.9
Carbohydrates	6.5
Fibre content	1.5