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A Note on an Outbreak of Cowpea Mild Mottle Virus (CPMMV) in Common Bean in the River Nile State, Sudan

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Abstract: An outbreak of a devastating virus disease occurred in common bean (*Phaseolus vulgaris*) in Berber area, the River Nile State, during the 2004/2005 cropping season, with symptoms of stunting and yellowing. The disease incidence reached a level of more than 85% in all visited fields. One hundred fifty symptomatic samples, collected from different fields at Hudeiba, Berber and Shendi, were blotted on nitrocellulose membranes and tested for the presence of different viruses, using the tissue blot immunoassay (TBIA) technique. The results of the serological tests revealed that 95% of the samples were positive for cowpea mild mottle virus (CPMMV). Among the common bean genotypes screened for resistance to CPMMV, only RO/2/1 and Giza 3 were resistant to the disease.

Key words: CPMMV; common bean; River Nile State; Sudan

Common bean (*Phaseolus vulgaris* L). is the second most important winter food legume crop in Sudan. It is produced in the River Nile State, northern Sudan, mainly in Berber under residual moisture after recession of the River Nile. A virus-like disease with symptoms of severe stunting and yellowing and eventual collapse of the plant has been noticed in this crop, a long time ago, at the farms of Hudeiba and Shendi Research Stations.

An outbreak of this disease occurred in the common bean crop grown in Berber area during 2004/05 season. A systematic survey was thus carried out to determine the incidence and causal agent of this disease. Thirteen randomly chosen fields each of 10 feddans (1 fed.= 0.42 ha) were visited. These fields represented all the area allotted to the common bean in Berber. The average incidence of the disease was 85%. Heavy infestation of the crop with whitefly (*Bemicia tabaci*) might have been involved in

this epidemic outbreak. As a result of this epidemic, some farmers ploughed in their farms and had to re-sow their common bean crops out of season, whereas others planted their farms with faba bean. The complete failure of 2004/2005 cropping season and the great reduction (about 75%), in common bean production led to substantial economic losses.

Seventy, forty and forty symptomatic plant samples were collected from different fields in Berber, Hudeiba and Shendi, respectively, and blotted on nitrocellulose membranes. The samples were tested for the presence of viruses using tissue blot immunoassay (TBIA) serological technique, as described by Lin *et al*. (1990), Hsu *et al*. (1990) and Hsu and Lawson (1991). Five antisera were used; namely, general luteovirus-specific monoclonal antibodies (MAb) 5G4 to luteoviruses, a mixture of MAbs to faba bean necrotic yellows virus (FBNYV), a general potyvirus- specific MAb 3H8 to potyviruses, as well as polyclonal antibodies to chickpea chlorotic dwarf virus (CpCDV) and cowpea mild mottle virus (CPMMV). The results of TBIA tests revealed that 142 samples out of 150 (94.7%) gave positive reaction to CPMMV, and none of the samples reacted with any of the other antisera. These results confirmed a causal relationship between CPMMV and the severe disease of the common bean in the River Nile State, and thus CPMMV appeared to be the predominant virus in common bean in Sudan. CPMMV was first reported on cowpea, (*Vigna unguiculata*) in Ghana causing mild mottle, but occasionally severe systemic chlorosis and necrosis (Brunt and Kenten 1973). In the Sudan, it was reported for the first time in groundnut (El-Hassan *et al*. 1997). CPMMV is transmitted in the seed and by the whitefly (*Bemisia tabaci*), in non- persistent manner, and it infects many leguminous crop such as groundnut, cowpea, alfalfa and soybean.

It is worth mentioning that ninteen common bean genotypes of the advanced yield trial at Shendi Research Station were tested for resistance to CPMMV during the 2000/01 and 2002/03 seasons. They were found to be susceptible to the virus except cv. R0/2/1 and Giza 3 which were resistant, based on visual symptoms (Table 1). To confirm the resistance of cv. R0/2/1, artificially inoculated plants of this cultivar were tested for CPMMV using enzyme -linked immunosorbent assay (ELISA) as

described by Clark and Adam (1977). The reaction was considered positive when the absorbance reading value was three times more than the value of healthy control. All the tested plants of R0/2/1 gave negative ELISA reaction as their mean absorbance value (optical density) was 0.019 compared with 0.014 for the control. Giza 3 also seemed to be resistant as it showed no symptoms, but ELISA tests are needed for confirmation.

In conclusion, despite high incidence of the CPMMV in Sudan, no ecological studies on this virus have yet been carried out. So the role of the whitefly, host range and environmental conditions in the spread of CPMMV needs to be investigated. Resistance as a practical solution also needs to be looked for in the indigenous and exotic materials.

Table 1. Incidence (%) of CPMMV in 19 common bean genotypes evaluated at Shendi Research Station during 2000/01 and 2002/03

Genotype	2000/01		2002/02
	Infected plants (%)	Yield (kg/ha)	Infected plants (%)
Blanco laran	93.6	516	100.0
Blanco brand	93.5	662	91.5
Albubia Girilos	91.3	457	90.0
BA 36	88.8	644	97.5
Star light	88.8	613	92.5
JM 24	87.5	859	91.3
KO 440	82.5	671	95.5
Raz 26	80.0	432	91.0
B3B 342	78.6	614	95.0
AND 1024	77.5	463	96.3
Harris	75.0	590	91.2
NEMA 89004	73.6	550	83.5
54028	73.4	1059	90.0
CIF 89004	72.5	442	85.0
Waf 132	66.3	646	86.3
Waf 22	65.0	585	67.5
Waf 21	65.0	297	87.5
Giza 3	0.3	986	0.4
RO/2/1	0.1	1006	0.2

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انتشار وبائى لمرض تبرقش اللوبيا الضعيف فى محصول الفاصوليا بولاية نهر النيل، السودان

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المستخلص: في موسم 2005/2004، ظهر مرض فيروسى على محصول الفاصوليا بصورة وبائية بمنطقة بربر بولاية نهر النيل (السودان). تتميز أعراض المرض باصفرار وتقزم النباتات المصابة. كانت نسبة المرض عالية حيث بلغت 85% في جميع الحقول التي تمت زيارتها. جمعت 150 عينة من أوراق نباتات مصابة من الحديبة وبربر وشندى وطبعت على ورق النايتروسيليلوز بغرض اختبارها لمجموعة من الفيروسات باستخدام تقنية البصمة النسيجية. أوضحت نتائج الفحص أن 95% من العينات كانت ايجابية لمرض تبرقش اللوبيا الضعيف، وأثبت صنفي الفاصوليا RO/2/1 وجيزة 3 مقاومة لهذا المرض.