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Pearl Millet as a Bait Crop for the Management of the Indian Peanut Clump Virus

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Clump disease is one of the major constraints to groundnut production in sandy soils in the state of Rajasthan (Mathur and Sobti, 1993). The disease is also present in the states of Andhra Pradesh, Gujarat, Punjab and Tamil Nadu, and it is caused by the Indian peanut clump virus (IPCV) (Reddy *et al.*, 1988) a furovirus transmitted by the root obligate endoparasite fungus *Polymyxa* sp. (Ratna *et al.*, 1991). No resistance could be identified in more than 9000 groundnut lines, including wild *Arachis* species, tested in Andhra Pradesh and Punjab. Chemicals such as nematicides, though effective to reduce disease incidence are hazardous and not economical for small scale farmers. Although soil solarization has been shown to be effective in reducing the disease incidence it can only be applied to small patches, additionally it can be polluting if no degradable plastic sheets are used (Reddy *et al.*, 1988).

At ICRISAT Asia Centre, in colloboration with scientists from Universite Catholique de Louvain, Louvain-la-Neuve, Belgium, studies on the epidemiology of the fungal vector *Polymyxa* sp. were initiated (Delfosse *et al.*, 1996 and Legreve *et al.*, 1996). It is apparent from these studies that *Polymyxa* sp. infects and transmits IPCV to such dicotyledonous hosts as groundnut, mainly during the rainy season with the onset of monsoon rains that follow the dry hot summer. The dry and hot condition prevailing during April and May are suspected to be conducive for the breakdown of dormancy of resting spores of *Polymyxa* sp. Early monsoon rains, which occur when the groundnut crops are young, may contribute to the release of high number of viruliferous zoospores, subsequently contributing to high disease incidence. Even though *Polymyxa* sp. infects dicots, it does not multiply in these hosts. On the contrary, monocotyledonous hosts such as sorghum and pearl millet were found to be excellent hosts for supporting the fungus multiplication as well as the virus replication. Monocotyledonous hosts can be infected throughout the year, because their infection does not require the breakdown of resting spores dormancy by climatic factors. We suspect the root exucates can trigger the release of zoospores. After infection *Polymyxa* sp. requires 10 to 12 days to produce new resting spores in the cortical root cells of sorghum and pearl millet (Ratna *et al.*, 1991 and Legreve *et al.* 1996). Since monocotyledonous crops appear to induce resting spore germination, it is suspected that using these as bait crops would lead to reduction of inoculum potential in the soil.

The method that was experimented consisted of sowing pearl millet prior to sowing groundnut, allowing the millet crop to grow for 15 days and then ploughing it in the soil. Indeed, in 15 days *Polymxya* sp. can produce few resting spores, but mainly the fungus will be in plasmodial and zooporangial stages, and it is unlikely that these stages of *Polymyxa* can survive in roots of plants ploughed into the soil.

Experiments were conducted at IAC in Sanga Reddy district and at Ganapavaram in Guntur district in Andhra Pradesh to assess if pearl millet could be beneficially used as a bait crop to reduce the disease incidence. Pearl millet was selected among various monocotyledonous crops because its seed is usually readily available with farmers at a very low cost and it has a very fast root development that will allow to explore a large volume of soil in 15 days. During the

1996 rainy season six patches infested by the Hyderabad isolate of IPCV (H-IPCV) were selected on IAC farm, and in 1996-97 post rainy season seven patches infested by the Bapatla isolate (B-IPCV) were chosen on Mr. G. Apaji's farm , Ganapavarm in Guntur District. The plot size was 0.25 m^2 to minimise the variability due to heterogeneous distribution of the inoculum potential in the soil. In each infested patch, one plot was kept as fallow while the other one was sown with pearl millet (cv. ICMH-451) at 100 kg seed/ha to facilitate complete soil cover. Fifteen days after sowing, the pearl millet crop was ploughed into the soil and groundnut (cv. NCAC 17090) was sown in both the plots. One month after sowing, the disease incidence was recorded in groundnut on the basis of visual symptoms.

In all the plots the IPCV incidence was reduced where pearl millet was used as a bait crop (Table 1). In the case of H-IPCV, during the 1996 rainy season, the disease incidence was reduced substantially as compared to the untreated plots. The method also reduced the incidence of B-IPCV in the groundnut crop grown in the 1996-97 post rainy season. In addition to the effect on the virus incidence the pearl millet crop seemed to have favoured the groundnut growth possibly by increasing the organic matter content in the soil and also the water holding capacity. In view of these very encouraging results, similar experiments will be conducted in the farmer's fields in Rajasthan in collaboration with scientists from the Plant Pathology Department of Durgarpur Agricultural Research Station, Rajasthan Agricultural University, Jaipur to assess if pearl millet can be used as a bait crop for the management of clump disease and to analyse the mechanisms involved in the reduction of the soil inoculum.

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Table 1. Effect of pearl millet as a bait crop to reduce IPCV incidence.

	Virus incidence (5)				Paired t-test Significance*
	Mean	Maximum	Minimum	Std. Dev.	
H-IPCV infested field, 1996 rainy Season					
With pearl millet	14	29	4	8	
Without	62	94	32	21	P<0.001
B-IPCV infested field, 1996-1997 post rainy Season					
With Pearl Millet	7	10	2	3	
Without	20	39	3	11	P=0.037

* Level of significance for the difference in means between the two treatments for one season