Poster 32: The Rich Tapestry of Biological Control Targets and Agents in Sweetpotato Production Systems of Papua New Guinea

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We introduce our ongoing work in the sweetpotato production systems of Papua New Guinea (PNG) where cash-cropping is developing from subsistence farming. Here it is common for newly planted 'gardens' to be established close to, or even immediately adjacent to, old 'gardens' in which multiple successive sweetpotato crops have been grown. Increased pest and disease densities in old 'gardens' (along with nutrient depletion) cause marked decreases in vigour and health of crops (Fig. P32.1). These biotic threats may readily more to nearby new 'gardens'. Surveys of growers have shown high levels of pest and disease impact on sweetpotato (Gurr *et al.*, 2016). Weevils, gall mite and scab are the top three major crop protection issues for farmers (Fig. P32.2) in both new and old 'gardens'.

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Fig. P32.1. Contrasting vigour of sweetpotato crops in old 'gardens' (left) and new 'gardens' (right). (Photo: G.M. Gurr).

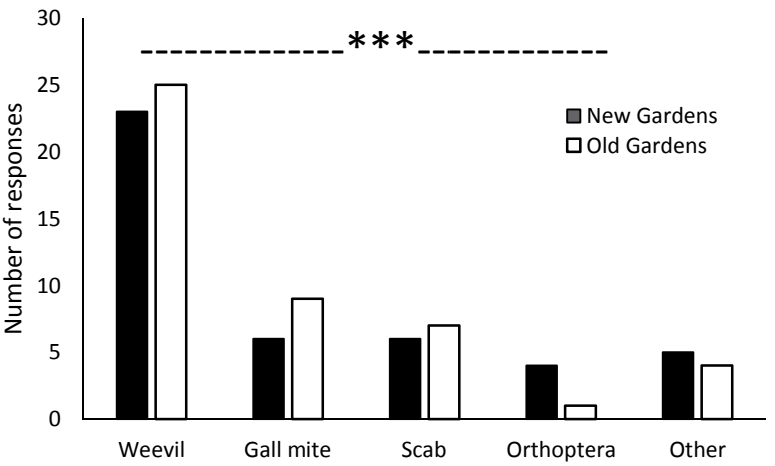

Fig. P32.2. Major plant protection issues cited in the top three concerns by farmers' for pest and disease problems. (χ^2 tests compared pest types within each garden age: new gardens, priority is used by times been listed without giving any points. Weevil: χ^2 =16.448, df =4, p=0.002; old gardens, χ^2=23.836, df =4, p<0.001).

Despite growers reporting use of a wide range of plant protection methods including biological control with chickens and pigs, a large majority use no active intervention (Fig. P32.3). Our work is evaluating the wider potential for other forms of biological control

intervention to complement traditional practices such as the use of domesticated vertebrates to consume pests and crop residues. Field surveys in PNG as well as in Australia are being used to explore the diversity of natural enemies, whilst laboratory and field studies are comparing candidate entomopathogens, e.g., *Metarhizium* spp. (Clavicipitaceae) and *Pasteuria* spp. (Pasteuriaceae). Complementary work is exploring the potential benefits of using native and naturalised plant species as barrier plants around new 'gardens' to reduce immigration of pests, especially weevils, from old 'gardens'. Among these plants are *Tephrosia* spp. (Fabaceae) (Fig. P32.4) that are known to have biocidal/ repellent properties (Belmain *et al.*, 2012) and may also provide flora resources to natural enemies such as parasitoids.

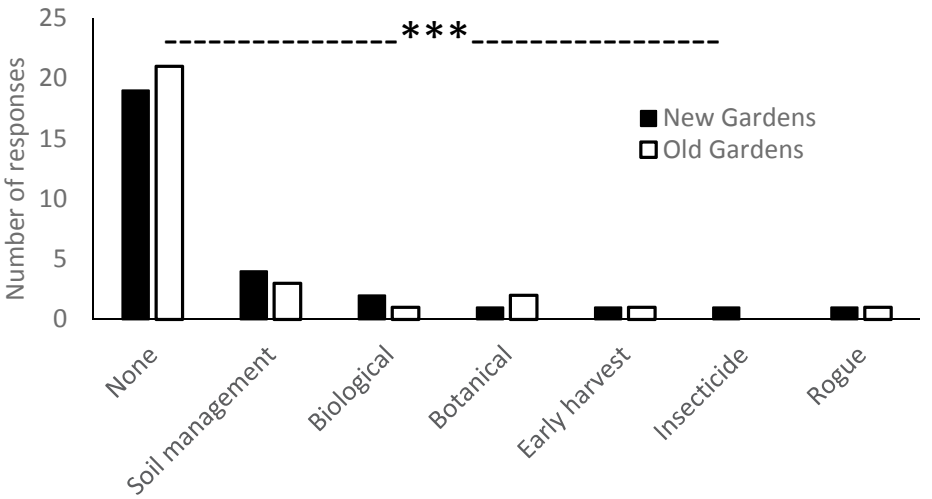

Fig. P32.3. Reported actions taken to control pests on sweetpotato crops. (χ^2 tests compared management approaches within each garden age: new gardens, χ^2 =41.989, df =6, p<0.001; old gardens, χ^2=52.738, df =6, p<0.001.).

Fig. P32.4. Uncultivated *Tephrosia* sp. in the Highlands of Papua New Guinea; a potential barrier to pest movement and nectar source for natural enemies. (Photo: G.M. Gurr).

References

Belmain, S.R., Amoah, B.A., Nyirenda, S.P., Kamanula, J.F. and Stevenson, P.C. (2012) Highly variable insect control efficacy of *Tephrosia vogelii* chemotypes. *Journal of Agricultural and Food Chemistry*, 60, 10055–10063.

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