

Pests Spectrum of Yacon (*Smallanthus* spp: Asteraceae) - A Review

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Abstract—The detail information on pests spectrum of Yacon is meager. Pests reported from different Yacon growing parts of World which causes damage belongs to order Lepidoptera, Hemiptera, Thysanoptera, Coleoptera, Diptera, Orthoptera, Nematodes, Acarina and some vertebrate pests i.e. rodents and deer . Of which, Mamestra brassicae, Sacropolia illoba, Spodoptera eridania, Chlosyne lacinia saundersii, Papilio sp.,Platyptilia fatfarella, Agrotis ipsilon, Copitarsia turbata, Agriolimax sp., Lopper caterpillar (Lepidoptera); Liriomyza sp.(Diptera); Lagria villosa, Cerotoma arcuata, Diabrotica speciosa, Diabrotica sp., Golofa aegeon, Passalus sp., (Coleoptera); Aphis gossypii, Myzus persicae, Empoasca sp., Sting bugs, white fly, (Hemiptera); Schistocerca sp. (Orthoptera); Dasiprocta (rodent); Tetranychus ludeni (Acarina) were reported to cause injury to the Yacon plants. The caterpillar C. lacinia saundersii, known as sunflower caterpillar and Trialeurodes vaporariorum were the most important species, being observed throughout the yacon cycle. The data base on pests i.e. seasonal occurrence, nature and symptoms of damage, management strategies of Yacon is weak. This is urgent for formulation of specific pest control strategies in Yacon.

1. Introduction

Yacon or Ground Apple (*Smallanthus* spp.) belongs to family Asteraceae. It is basically an annual root-propagated tuber crop (similar to Dahlia) possibly from Latin America (Peru, Argentina, Bolivia, Brazil). It is also well-spread in Japan at altitude ranging from 2000 to 3400 meters [1]. Very recently in India, farmers of Darjeeling Himalya started cultivation of Yacon and claim that it has great medicinal value and its roots, leaves are used to treat diabetes [2-3]. In west Bengal it is grown in Sukya Pokhari block in villages like Pungdung, Maneybhajyang, Pokhrebung and Simana areas of Darjeeling hill.

Recently, many researchers have been interested in this plant due to its potential as functional food, mainly for its composition in oligosaccharides of low degree of polymerization, which can reach 67% of dry matter soon after harvest [4]. It is consumed as a fruit and eaten raw, smells like

apple. It is also used as a salad crop. It contains fructooligosaccharides (FOS) and inulin, the consumption of which improves the growth of bifidobacteria in the colon, enhances mineral absorption, gastrointestinal metabolism and plays a role in the regulation of serum cholesterol.

2. Yacon pests

Yacon foliage is attractive to many pests, including slugs, caterpillar, waterfowl, rabbits and deer. Pest pressure in Yacon is much lower in the dry valleys of the Andes than in humid areas [5]. Yacon has two pests protective system trichomes and increased density of glands that excrete sesqui- and diterpenes to repel insects on its leaves and stems. These are responsible for little insect infestation [6]. Rodent of the genus *Dasiprocta* attack tuberous roots in the La Paz region in Bolivia [5]. In Peru, insect pests which feed by eating the above ground part, including leaves and flowers i.e. *Liriomyza* sp. (Diptera: Agromyzidae); *Diabrotica undecimpunctata* and *Diabrotica speciosa* (Coleoptera: Chrysomelidae), *Agrotis ipsilon* and *Copitarsia turbata* (Lepidoptera: Noctuidae); *Schistocerca* sp. (Orthoptera: Acrididae); and other two insects of Acrididae and Trydactydae families. Also reported attack of slug (*Agriolimax* sp.: Limacidae). Attacking the underground parts, *Golofa aegeon* (Coleoptera: Scarabaeidae) and *Passalus* sp. (Coleoptera: Passalidae) were observed. The sucking insects like green leafhopper (*Empoasca* sp.), showed lower occurrence (Hemiptera: Cicadellidae), and aphids, *Aphis* sp. and *Myzus persicae* (Hemiptera: Aphididae). In season 2001-2002, in the region of Cajamarca, in Peru, a type of red mite (*Tetranychus* sp.) was noticed attacking the leaves [12]. Their active ingredient is *ent*-kaurenic acid and its esters and derivatives. Insect pests that cause damage to the Yacon were studied in field condition at Takikawa in the year 2001. Nine species of Lepidoptera, three species of Hemiptera, one each species of Thysanoptera and Coleoptera, and four species of Acarina injured the Yacon. Of these species, the cabbage armyworm (*Mamestra brassicae*), the mulberry caterpillar (*Sarcopolia illoba*), the cotton aphid (*Aphis gossypii*), and the desert spidermite (*Tetranychus ludeni* occurred in large number, they injured leaves. A tiger moth (*Platytilia fatfarella*) injured in buds and the tips of the stem, thereby inhibiting the growth of plant, however, this insect occur in small number [7]. Thus, cultivation of Yacon needs almost no pesticides; this is currently called "Organic Cultivation" and is beneficial for medicinal values and dietetic foods. Table 1 lists selected pests of Yacon. 10 pests reported to attacking Yacon in Peru and Brazil but wanting the occurrence of pests and diseases in Europe [8]. The Hana region, Olomouc and Czech Republic of Central Europe the Yacon crop reported regular occurrence of *Trialeurodes vaporariorum* and sporadic attack of *Citotella atropunctata* [9] Deer, they usually don't do widespread damage, but occasionally find a plant that has been stripped back to the stem. Field mice can be a problem late in the season, when

they sometimes dig up and eat the rhizome [10]. One study conducted at Alegre under Espirito Santo State of Brazil in the year 2013 and reported three species from Coleoptera i.e. *Lagiria villosa*, *Cerotoma arcuata* and *Diabrotica speciosa* and two species from Lepidoptera i.e. *Spodoptera eridania* and *Chlosyne lacinia saundersii* causing damage to the Yacon crop. The caterpillar *Chlosyne lacinia saundersii*, known as sunflower caterpillar, was the most important species, being observed throughout the crop cycle [11].

3. Pest Management

Pests specific management practices of this crop is lacking as it has been in some other crops. Yacon leaves have two defense systems: the first consists of a large amount of trichomes which prevent the access of insects. The second system is chemical type, formed by the presence of special glands containing some type of toxic substance, to be identified [12]. The combination of these defense mechanisms contributes to yacon leaves suffer fewer insect attacks, making less frequent insects occurrence reports. However, the three main pests management approaches i.e. mechanical, chemical and biological have been used to control pests. For chemical control, contact or systemic insecticides (pyrethroids or neonicotinoids) have been used against some insects (*Acordulecera* sp., *Epitrix* sp., *Diabrotica* sp.). Biological protection is represented by bacteria (*Klebsiella oxytoca*. And *Erwinia uredovora*) that are able to control leaf microflora by conservation of hydroxycinnamic acids on dicarboxylates. Presence of the insect predator *Cycloneda* spp. (Coccinellidae) on Yacon in the fields has been recorded. In Argentina, only in sporadic cases farmers perform insect control, usually when the crop is close to other crops such as potatoes and corn [13].

4. Research needs and Conclusion

Evaluation of pests and diseases and the resistance/tolerance present in different clones. Development of IPM and organic management systems for yacon. While pest pressure appears to be low at present, this may rapidly change if there is an increase in the cultivated area. The works on the insect pests of Yacon plants are meager, so, the database on pests of these plants is also weak. The nature of interactions between medicinal plants and their insect herbivores are not completely known. This is urgent for formulation of specific pest control strategies in medicinal plants.

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