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Studies on Pest-Risk Involved in Import of Medicinal Plants

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Germplasm of medicinal plants introduced through the Bureau comprises not only species of economic importance, but also of wild and related species. In order to know in advance as to which pests can come with the introduced material, crop-wise world literature was screened to compile the information on pests recorded, their nature of damage, life history, distribution, host range and susceptibility to the available disinfestation procedure and possible detection techniques. With this background information, an analysis was made to pinpoint the pest risk that can be present in the introduced material of Cassia, Chrysanthemum, Digitalis, Dioscorea, Glycyrrhiza, Hyoscyamus, Mentha, Olea, Papaver, Plantago, Rauvolfia, Vinca *and* Withania *and in the likely event, how best to detect their presence at the time of quarantine examination, and finally how to liquidate them effectively and lower the quarantine risk so that the much needed medicinal germplasm could be made available to the users in India.*

Some important exotic pests which can come with seeds of these crops as hidden infestation, include Bruchidius *spp.*, Caryedon *spp. and some other bruchids* (Cassia), Bruchidius glycyrrhizae, B. halodendri *and* Bruchophagus glycyrrhizae (Glycyrrhiza), Eurytoma oleae *ssp.* vericolor (Olea), Gymnetron pascuorum *and* G. plantaginis (Plantago), *necessitating X-ray radiography of seeds for detection of infestation as well as salvaging the germplasm. Other important exotic pests which can accompany the plant propagules include* Euscepes postfasciatus, Palaeopus costicollis (Dioscorea *tubers*) *and several species of aphids, capsids, jassids, mirids and thrips* (*plants and cuttings of* Chrysanthemum, Glycyrrhiza, Mentha, Olea, Rauvolfia, *and* Vinca) *requiring fumigation of material, detention and refumigation, if necessary.*

In the augmentation of plant genetic resources through introduction, quarantine has a significant role to play so as to exclude the dangerous pests. First logical requisite for effective and efficient quarantine is the knowledge of pests that are likely to sneak in with a particular material and necessary safeguards to prevent their entry (Mc Cubin, 1954). Generally, such information is lacking, especially in case of germplasm which comprises not only of species of economic importance, but also the related species as well as wild and weedy taxa. Therefore, efforts were made to collect and collate relevant data on the insect pests associated with some medicinal plants so as to ensure introduction of valuable germplasm free from exotic pests.

MATERIALS AND METHODS

The study embraced important medicinal plants, namely *Cassia, Chrysanthemum, Digitalis, Dioscorea, Glycyrrhiza, Hyoscyamus, Mentha, Olea, Papaver, Plantago, Rauvolfia, Vinca* and *Withania*. Crop-wise world literature was screened and information collected was systematised in such a manner that it could serve as a data bank from which relevant details required to meet potential quarantine situations could be drawn at the time of quarantine processing of material, as shown in the flow chart (Fig. 1). Information on the pests reported on these crops the world over; biology and habits of different pests and stages thereof (eggs, larvae/nymphs, pupae, adults) which are likely to get transported; the kind of germplasm (seeds, vegetative propagules, whole plants, root/stem cuttings, tubers, etc) and the nature of infestation (latent, visible); according to which a suitable detection and disinfestation procedure is employed, is summarised. Pests not reported from India specially require strict vigil and safeguards to prevent their entry.

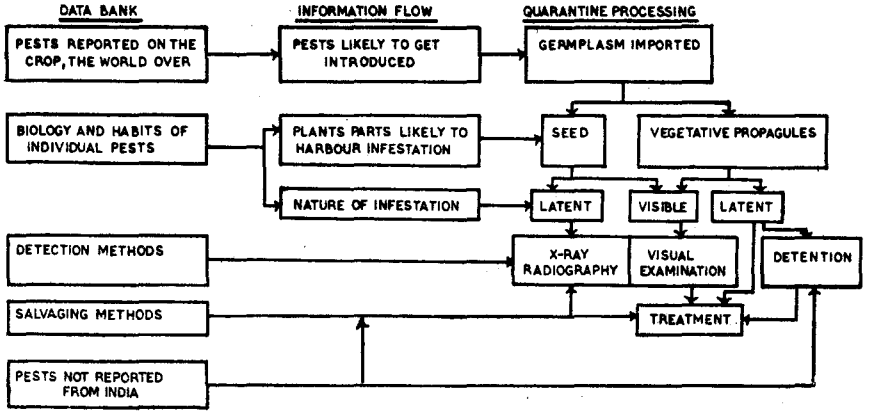

Fig. 1 Information on crop pests as an aid to plant quarantine.

RESULTS AND DISCUSSION

Pest Record

All the medicinal plants included in the study are propagated through seeds, but some of them such as *Chrysanthemum, Dioscorea, Glycyrrhiza, Mentha, Olea, Rauvolfia* and *Vinca* are also propagated vegetatively. Therefore, plant parts other than seed, may also figure in import of germplasm of these genera. Keeping this in view, pest species noted on each of these plant genera from all over the world (Review of applied Entomology, 1913-1985) were grouped according to their feeding habits, the plant parts infested by them and stages thereof. There are no pests reported to feed on seeds of *Digitalis, Dioscorea, Rauvolfia, Vinca* and *Withania*. Therefore, seeds of these crops can be introduced without any pest-risk. However, a routine quarantine inspection must be carried out. Seeds of *Hyoscyamus* are reported to be attacked by *Ptinus fur* and *P. tectus* and those

of *Papaver* by *Lasioderma serricorne* and *Trogoderma granarium*. These are common storage pests and can be eliminated by fumigation of incoming seed (Anonymous, 1983).

Pests of major quarantine significance

These include pests which are not yet known from India (Anonymous, 1951-85) and which may accompany the imported germplasm (crop-wise details are given in Table 1). Detection and disinfestation requirements of these pests/pest families, depending upon their biology and habits (Davidson and Peairs, 1966; Kranze *et al.*, 1977; Hill, 1985; Metcalf and Flint, 1979) are discussed below.

TABLE 1. PESTS OF MAJOR QUARANTINE SIGNIFICANCE

Crop	Pest		Plant parts infested	Country reported from
	Name	Family		
Cassia	*Acanthoscelides ferrugineipennis*	Bruchidae	seed	Chile
	Bruchidius mackenziei	Bruchidae	seed	Australia
	Caryedon cassieae	Bruchidae	seed	Rhodesia
	Sennius spp.	Bruchidae	seed	USA
Chrysanthemum	*Bruchidius perparvulus*	Bruchidae	seed	France
	Otiorhynchus spp.	Curculiondiae	root & stem	USA
	Lygus pratensis	Miridae	leaves & shoots	Europe
	Thrips nigropilosus	Thripidae	leaves & shoots	USSR
Dioscorea	*Euscepes postfasciatus*	Curculiondiae	tubers	Oceania
	Palaeopus costicollis	Curculiondiae	tubers	Jamaica
Glycyrrhiza	*Bruchidius glycyrrhizae*	Bruchidae	seed	Iraq
	Bruchophagus glycyrrhizae	Eurytomidae	seed	Iraq
	Acinopterus angulatus	Cicadellidae	leaves & shoots	C. America
	Margarodes glycyrrhizae	Marga rodidae	roots	Iran
Mentha	*Bruchidius albosparsus*	Bruchidae	seed	Africa
	Otiorhynchus ovatus	Curculionidae	roots	USA
	Erythroneura parvula	Cicadellidae	leaves & shoots	UK
	Lygus lineolaris	Miridae	leaves & shoots	USA
Olea	*Eurytoma olea* spp. *vericolor*	Eurytomidae	seed	S. Africa
	Otiorhynchus cribricollis	Curculionidae	roots	Turkey
	Prays oleae	Yponomeutidae	Inflorescence & leaves	USSR
	Aspidiotus nerii	Diaspididae	leaves & shoots	Turkey
Plantago	*Gymnetron pascuorum*	Curculionidae	seed	Denmark
	G. plantaginis	Curculionidae	seed	Italy
Rauvolfia	*Pinnaspis pattersonii*	Coccidae	leaves & shoots	Ghana
	Helopeltis rauwolfiae	Miridae	leaves & shoots	Zaire
Vinca	*Geoica radicicola*	Aphididae	roots	USA
	Neoaliturus tenellus	Cicadellidae	leaves & shoot	USA
	Oncometopia nigricans	Cicadellidae	leaves & shoots	USA

Pests accompanying seeds

Species of families Bruchidae and Eurytomidae are reported to infest seeds of *Cassia, Chrysanthemum, Glycyrrhiza, Mentha* and *Olea*. These oviposit on, or in the seed/fruit. Hatching larvae bore inside the seeds, feed and pupate there. Infested seeds thus look apparently healthy till the adults emerge. Such latent infestation can be detected through X-ray radiography (Wadhi *et al.*, 1967; Wadhi and Verma, 1971). By holding the seed sample as exposed on X-ray plate and using its geometrical confirguation, the infested seeds can be handpicked (Wadhi, 1983). Infestation of Curculionidae in *Plantago* seeds can also be detected and got rid of by X-ray radiography (Anonymous, 1983).

Pests accompanying vegetative propagules

Euscepes postfasciatus and *Palaeopus costicollis* (Curculionidae)—All stages of these weevils are found inside the tubers of *Dioscorea*. Therefore, these cannot be detected through inspection and material must be compulsorily fumigated with methyl bromide @ 56 mg per litre for 4h at 21°C and at NAP (Roth and Richardrson, 1965).

Otiorhynchus spp. (Curculionidae)—larvae of the pest feed among roots and adults on the leaves of *Chrysanthemum, Mentha* and *Olea* requiring fumigation of infested material except that of *Chrysanthemum* which is sensitive to the treatment. All stages of these weevils can also come with soil adhering to the plants necessitating introduction of only soil free planting material.

Prays oleae (Yponomeutidae)—Larvae mine the leaves and also bore into inflorescence and fruits of *Olea*. Final instar feeds on the surface and pupate among leaves or bark. The pest can be eleminated by hand removal of pest/infested plant parts or through a suitable treatment.

Aphididae, Coccidae, Diaspididae, Margarodidae—All stages are exposed, nymphs and adults suck the sap from various plant parts of *Glycyrrhiza, Olea, Rauvolfia* and *Vinca*. These can be detected by careful examination of material with magnifying aids. Susceptibility of eggs to various treatments in most cases is doubtful (Pradhan and Wadhi, 1962). Therefore, it is necessary to detain the material in quarantine after treatment, for completion of the incubation period (about a week). In case the eggs hatch, a second treatment is to be given for complete disinfestation.

Cicadellidae, Miridae, Thripidae—Pests belonging to these families are similar in habit to those mentioned earlier and so are the detection and disinfestation requirements except that these insects insert their eggs in plant tissue, rendering them undetectable during visual inspection. It is, therefore, necessary to detain the incoming material in quarantine for completion of the incubation period (one to two weeks) so as to allow the eggs, if present, to hatch and infestation to be detected. In the event of visible infestation by adults of these pests, material is required to be treated immediately and then, if necessary, after the detention period, as per schedules available (Anonymous, 1970). However, in view of low

plant tolerance to fumigation, it is safer to use disinfestation procedures like mechanical removal of infestation and a recommended insecticidal dip treatment, unless otherwise specified.

CONCLUSIONS

Seeds of *Cassia, Chrysanthemum, Glycyrrhiza, Mentha, Olea*, species and *Plantago* should be compulsorily screened through X-ray radiography for detection of latent infestation and also for salvaging the germplasm.

Seeds of *Digitalis, Dioscorea, Hyoscyamus, Papaver, Rauvolfia, Vinca* and *Withania* should be examined visually and if necessary, be fumigated.

Tubers of *Dioscorea* should be compulsorily fumigated against latent infestation of weevils.

Only soil free plants, rooted cuttings and tubers should be admitted.

Plants and cuttings of *Chrysanthemum, Glycyrrhiza, Mentha, Olea, Rauvolfia* and *Vinca* should be carefully examined with magnifying aids and detained in quarantine for one to two weeks so as to allow the eggs to hatchout. A suitable disinfestation treatment should be given immediately and if necessary, after the detention period.

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