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P204. Eco-friendly approaches in the integrated management of Asian soybean rust caused by *Phakopsora pachyrhizi* in India

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The Asian Soybean rust, *Phakopsora pachyrhizi* Syd is the major stumbling block for successful cultivation of soybean in India. Identification of resistant source against such systemic biotic infection is a challenging task for Plant Pathologists and Plant Breeders. Under the backdrop of lack of resistant sources for general cultivation, the management options with chemicals, bioagents always helped the successful raising of crop in India. In this study, different treatments of comprising of Achook (0.15% Azadirachtin EC) a neem based products alone and in simultaneous application with different fungicides were evaluated during Kharif 2008 under natural epiphytotic conditions of Asian Soybean Rust at MARS, UAS, Dharwad. The treatments were applied thrice with first one immediately after appearance of symptoms in the field and subsequently at 10 days interval. Among the combination application, spraying with Achook (0.15% Azadirachtin EC) @0.5%-Hexaconazole@0.1%- Achook (0.15% Azadirachtin EC) @0.5% recorded minimum (38.27) Percent Disease Index (PDI) followed by 41.97 PDI in case of spraying with Achook (0.15% Azadirachtin EC) 2.0%. However, application Hexaconazole @0.1% alone-recorded minimum incidence of 23.21 PDI. The untreated check recorded maximum PDI (67.90). Maximum seed yield of 11.35q/ha was recorded in Hexaconazole@0.1% followed by 10.0q/ha in Achook (0.15% Azadirachtin EC) @0.5%-Hexaconazole@0.1%- Achook (0.15% Azadirachtin EC) @0.5%. Minimum seed yield of 4.46q/ha was recorded in untreated check. The present findings will open a new window of opportunity in utilization of Achook (0.15% Azadirachtin EC) as one of component spray in development of spray schedule against Asian soybean rust in India.

Keywords Asian soybean rust, *phakopsora pachyrhizi*, integrated management

P205. Phytophthora root and stem rot (*Phytophthora sojae*) of soybean in Brazil

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Phytophthora root and stem rot (*Phytophthora sojae*) of soybean was discovered in Brazil in 1994/95 growing season, in Passo Fundo, state of Rio Grande do Sul. The incidence and severity of the disease were insignificant until 2005/06, when a new and severe resurgence was observed. Nowadays, it can be found in nearly all soybean fields in the South and part of the Mid-West regions of Brasil, associated with compacted clay soils and heavy rain periods. Studies have been conducted in order to characterize the causal agent and to select soybean germplasm with genetic resistance. A monozospore collection was formed with samples collected in four Brazilian states (Rio Grande do Sul, Paraná, Minas Gerais, and Mato Grosso do Sul). From some of these samples, cytochrome oxidase 1 and 2 were partially sequenced and showed 100% genetic similarity with an American *P. sojae* pattern. Soybean cultivars with genetic background including descendents of FT-Abyara and Sharkey have shown resistance reaction in greenhouse tests and in infested fields. Preliminary studies have demonstrated that the prevalent virulence formula was Rps 1a, 7 (= race 3). An inoculation method of the hypocotyl using infected toothpicks was adapted to screen soybean germplasm to complete resistance as a routine in the breeding soybean program. Partial resistance is also

searched in some promising lines with the inoculum layer method.

Keywords *Glycine max*, *Phytophthora sojae*

P206. Biocontrol of soybean sclerotinia stem rot using *Bacillus subtilis* strain SB24

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Soybean sclerotinia stem rot, caused by *Sclerotinia sclerotiorum*, is an economically important disease in Canada. The objectives of this study were to evaluate *Bacillus subtilis* strain SB24 for its *in vitro* antagonism against *S. sclerotiorum* and possible biocontrol of soybean sclerotinia stem rot. By producing diffusible antifungal substances in PDA medium, SB24 significantly inhibited the pathogen mycelial growth by 51% and reduced sclerotial formation by 82%. When sprayed onto soybean plants 0 to 6 days prior to the inoculation with *S. sclerotiorum* in greenhouse, SB24 significantly reduced disease severity by 40 to 65%, compared to the untreated control. SB24 has no effect on the disease suppression if applied after plants were inoculated with the pathogen. When plants were inoculated daily from 0 to 2 days after a spray application of SB24 in the field, the bioagent significantly reduced disease severity by more than 40% averaged over the 15 day period after each inoculation. SB24 population on soybean leaves decreased by 1.5 log units during 15 days under field conditions and by 0.4 log units during 5 weeks under control conditions. Population dynamic patterns were significantly related to the rainfall accumulation in the field ($r = -0.95$, $P < 0.01$).

Keywords sclerotinia stem rot, biocontrol, *Bacillus subtilis*, *Sclerotinia sclerotiorum*

P207. Efficacy of plant extracts against *Spodoptera litura* (Fab.) and effect on its food utilization

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Insecticidal properties of several plant species offer not only suitable alternatives to chemical insecticides but are also safe to natural enemies and the environment. Therefore, efficacy of aqueous extracts of *Acacia arabica*, *Ipomoea carnea*, *Eucalyptus globulus*, *Annona squamosa*, *Lantana camara*, *Nicotiana tabacum*, *Datura stramonium* and *Pongamia pinnata* (leaves and/or seeds) against *Spodoptera litura* larvae and effect on various food utilization indices was studied under controlled conditions. Extracts of *Acacia*, *Annona*, *Datura* and *Nicotiana* leaves gave 50 % or more larval mortality within 24 hrs at lowest concentration i.e. 25 %. However, similar mortality was observed with *Ipomoea* and *Lantana* at 75 % concentration and with *Eucalyptus* at 100 % concentration. Strong synergistic effect and enhanced efficacy was observed when combinations of *Bacillus thuringiensis* var *kurstaki* (Btk) strain HD-1 (DiPel-8L, 17600 IU/g) @ 1.3 g/lit and extracts from seeds of *Acacia* (61.05 % larval mortality with combination of Btk and seed extract v/s 42.0 % with seed extract alone), *Datura* (52.98 % v/s 48.50 %) and *Annona* (74.67 % v/s 53.54 %) were used. Mortality due to combination was also more than Btk alone. The results of studies on food utilization indices revealed that leaves treated with *Acacia arabica* extract were consumed least (361.1 mg), whereas those treated with *Annona squamosa* the most (1008.4 mg). However, least weight gain by the larvae was observed in case of *Eucalyptus globulus* (81.0 mg) followed by *Datura stramonium* (112 mg).

Keywords plant extracts, efficacy, *Spodoptera litura*, *Bacillus thuringiensis*, synergism, food utilization