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ORIGINAL ARTICLE

Detection of new viruses in alfalfa, weeds and cultivated plants growing adjacent to alfalfa fields in Saudi Arabia

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Abstract A total of 1368 symptomatic plant samples showing different virus-like symptoms such as mottling, chlorosis, mosaic, yellow mosaic, vein clearing and stunting were collected from alfalfa, weed and cultivated plant species growing in vicinity of alfalfa fields in five principal regions of alfalfa production in Saudi Arabia. DAS-ELISA test indicated occurrence of 11 different viruses in these samples, 10 of which were detected for the first time in Saudi Arabia. Eighty percent of the alfalfa samples and 97.5% of the weed and cultivated plants samples were found to be infected with one or more of these viruses. Nine weed plant species were found to harbor these viruses namely, *Sonchus oleraceus, Chenopodium* spp., *Hibiscus* spp., *Cichorium intybus*, *Convolvulus arvensis*, *Malva parviflora*, *Rubus fruticosus*, *Hippuris vulgaris*, and *Flaveria trinervia*. These viruses were also detected in seven cultivated crop plants growing adjacent to the alfalfa fields including *Vigna unguiculata*, *Solanum tuberosum*, *Solanum melongena*, *Phaseolus vulgaris*, *Cucurbita maxima*, *Capsicum annuum*, and *Vicia faba*. The newly reported viruses together with their respective percent of detection in alfalfa, and in both weeds and cultivated crop plant species together were as follows: Bean leaf roll virus (BLRV) {12.5 and 4.5%}, Lucerne transient streak virus (LTSV) {2.9 and 3.5%}, Bean yellow mosaic virus (BYMV) {1.4 and 4.5%}, Bean common mosaic virus (BCMV) {1.2 and 4.5%}, Red clover vein mosaic virus (RCVMV) {1.2 and 4%}, White clover mosaic virus (WCIMV) {1.0 and 5%}, Cucumber mosaic virus (CMV) {0.8 and 3%}, Pea streak virus (PeSV) {0.4 and 4.5%} and Tobacco streak virus (TSV) {0.3 and 2.5%}. Alfalfa mosaic virus (AMV), the previously reported virus in alfalfa, had the highest percentage of detection in alfalfa accounting for 58.4% and 62.8% in the weeds and cultivated plants. Peanut stunt virus (PSV) was also detected for the first time in Saudi Arabia with a

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66.7% of infection in 90 alfalfa samples collected from the surveyed regions during the last visit that tested negative to all the previously detected viruses.

1. Introduction

Alfalfa is considered the most important forage crop in Saudi Arabia that is used for animal feeding. The area under cultivation of alfalfa was 126611 hectares in 2013 producing 2659449 tons (Ministry of Agriculture, 2014). The five most important regions for alfalfa production in Saudi Arabia include Riyadh, Qassim, Tabuk, Jouf and Hail (Fig. 1). More than 90% of the total alfalfa production in the Kingdom was from these regions. In an earlier survey of alfalfa fields in Saudi Arabia, only AMV was detected in several locations (AL-Shahwan, 2002). Several plant viruses besides Alfalfa mosaic virus (AMV) that were reported from alfalfa, such as Bean leaf roll virus (BLRV), Bean common mosaic virus (BCMV), Bean yellow mosaic virus (BYMV), Cucumber mosaic virus (CMV), Lucerne transient streak virus (LTSV), Pea streak virus (PeSV), Red clover vein mosaic virus (RCVMV), Tobacco streak virus (TSV), White clover mosaic virus (WCMV) and Peanut stunt virus (PSV) which were reported to infect this crop and other legumes worldwide (Guy et al., 2013; Jones, 2013; Jones et al., 2012; Massumi et al., 2012; Shah et al., 2006; Latham and Jones, 2001; Guy and Forster, 1996; Alan et al., 1996; Rahman and Peaden, 1993; Hiruki and Hampton, 1990; Stuteville and Erwin, 1990; McLaughlin and Boykin, 1988; Edwardson and Christie, 1986; Forster et al., 1985; Rao and Hiruki, 1985; Hampton, 1983) can negatively affect the production, quality, and durability of alfalfa. If the diseases associated with these viruses are not properly managed they will probably limit alfalfa production. In a previous study, it was reported that some weed and cultivated plant species were found to be infected with AMV besides other viruses that have been reported to infect alfalfa (Al-Shahwan and Abdalla, 1998). Our objective is to generate data that would reveal the situation of the viral disease complex of this crop

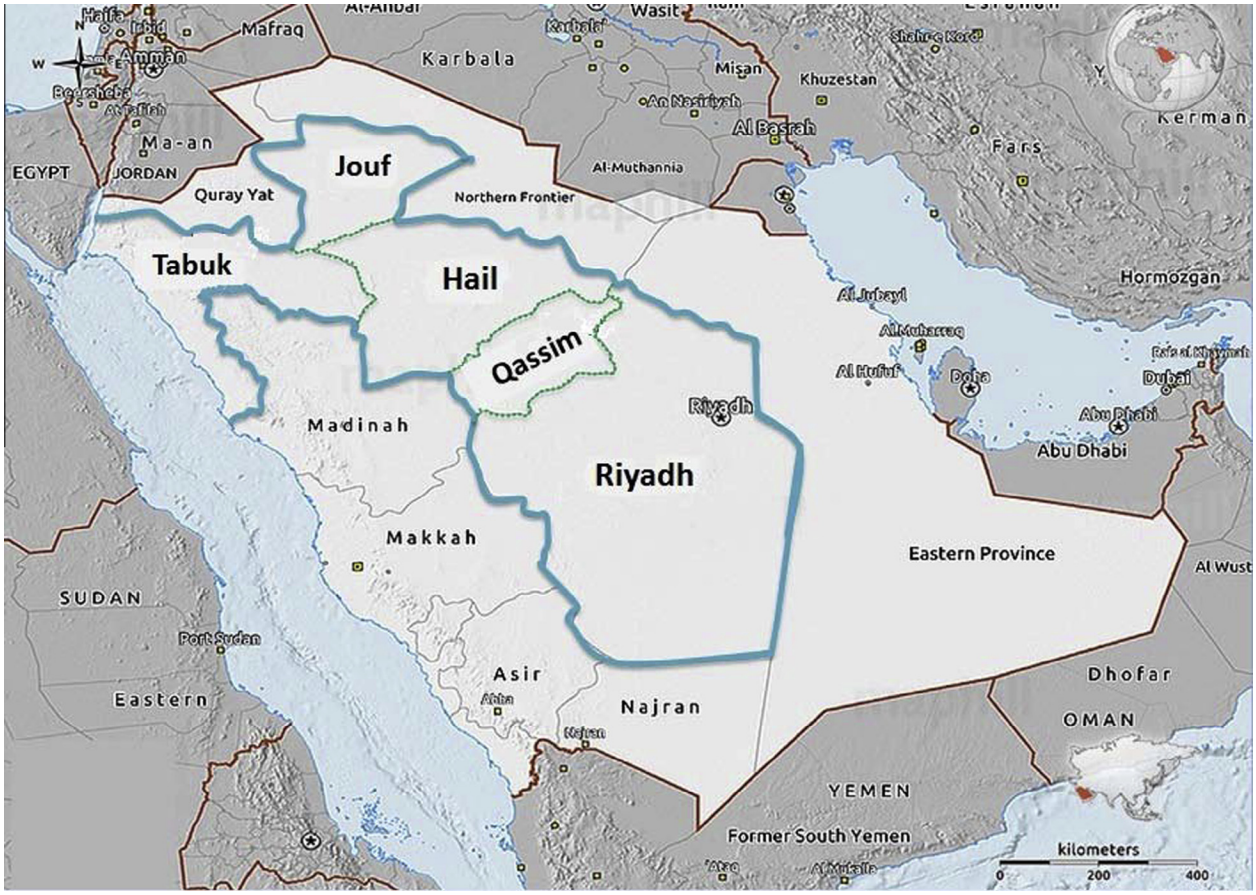

Figure 1 Map of Saudi Arabia showing the surveyed regions (Riyadh, Qassim, Hail, Jouf, and Tabuk) during the two year survey (2012–2013).