INSECT VECTORS OF VIRUS Y INFECTING POTATO PLANTS IN EGYPT

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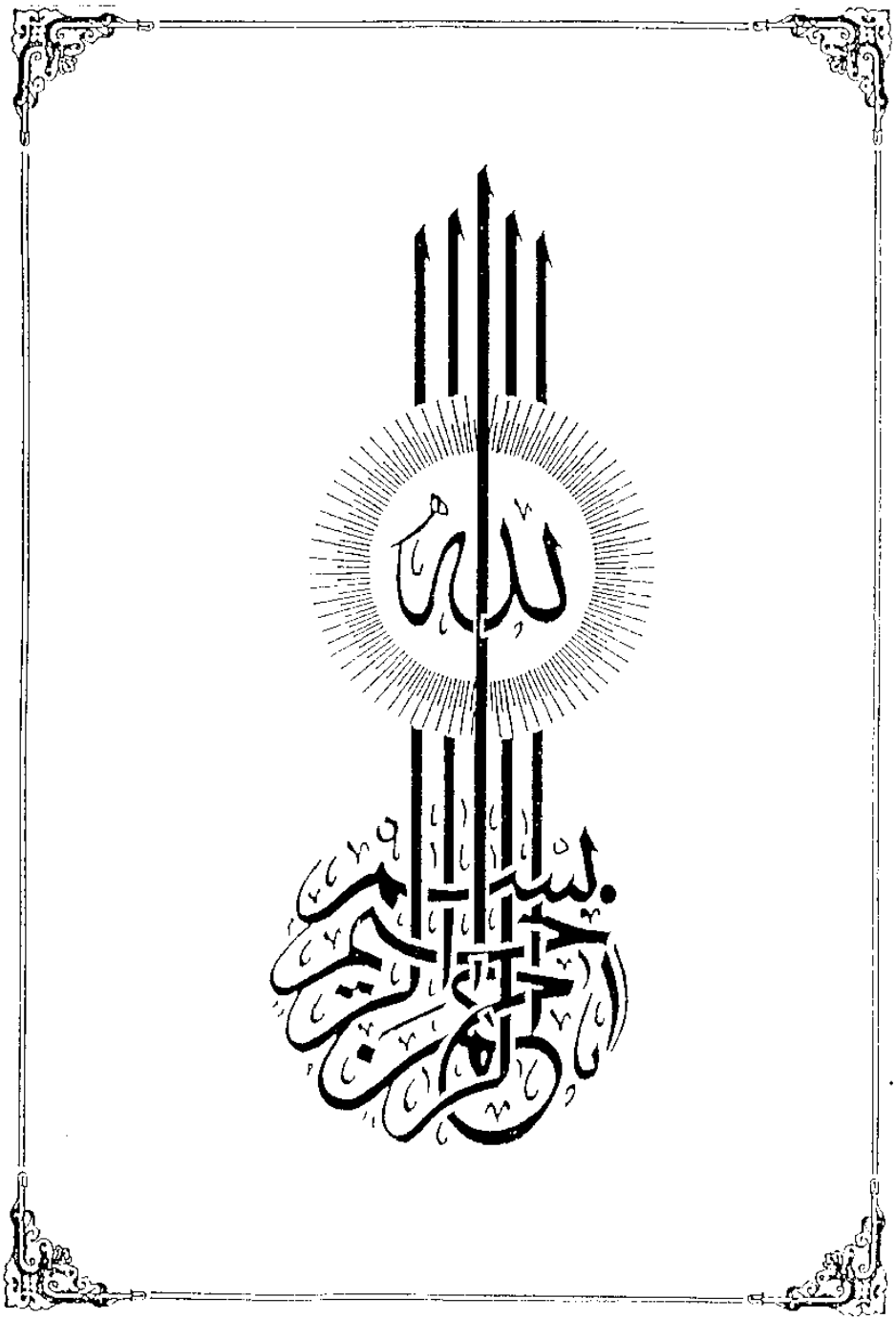

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INTRODUCTION

Virus Y is one of the most important Potato viruses. It has a world distribution occurring wherever potatoes are grown. Losses due to potato virus Y infection in U. A. R. amounted to 54 % of the crop (Omar et al, 1969). Infected plants may be symptomless or may show highly necrotic reaction, depending on the virus strain, the potato variety and the environmental conditions.

Different names have been used for viruses belonging to the virus Y group. This is due to the varied range of symptoms produced by different strains of the virus. Classification and nomenclature of the virus strains were and are still matters of dispute. German investigators divided the strains of the virus into three groups;- Common, necrotic and anomal. This classification was based on serological relationship, symptomatology and host range. Dutch invistigators divided potato virus Y strains into : - Y^{O}(Common strains), Y^{N} (Tobacco veinal necrosis strains and Y^{C} (Potato stipple streak) (DE Bokx, 1964).

Virus Y and its strains can be transmitted by a large number of aphid species of which Myzus persicae sulz.

is the most efficient under greenhouse conditions.

The present work was carried out to identify a PVY isolate which was isolated from potato fields in U. A. R. The insect vectors of a virus strain and the virus-vector relationship were studied.

REVIEW OF LITERATURE

Early records revealed that, Shultz & Folsom in (1923) reported a virus disease in Irish potato with rugose mosaic symptoms. The virus was easily transmitted by aphids and sap inoculation. Smith (1931) in England demonstrated that rugose mosaic disease symptoms were incited by a virus complex consisting of two viruses, one of which was transmitted by sap but not by aphids and was called potato virus X (PVX), the other virus was transmitted by both aphid and sap and was called potato virus Y (PVY). Later work on PVY showed that it is not a single uniform entity but exists as strains due to the great variation in symptoms expressed on potato and other hosts (Bawden & Kassanis, 1947, Bawden & Sheffield, 1944 and Darby et al, 1951). Darby et al (1951) working with 18 isolates of PVY and using as a criterion the average severity of symptoms incited on 22 American and British Potato varieties, divided these isolates into: mild, medium, severe and erratic.

Comman strains of PVY incite vein-banding and mild mottle symptoms on Nicotiana tabacum L. (Dykstra, 1936).

b- Medium isolates, which in general produce a moderate rugosity and leaf drop. No stem necrosis, petiole streaking or stunting are produced. They have a slight effect on the growth of the plants.

c- Erratic isolates. The (PVY - TVN) belongs to this group. This strain failed to produce symptoms when mechanically inoculated on fourteen potato varieties susceptible to the severe isolates. It seems that this strain is more virulent on tobacco than on potato, but Richardson (1958) found that this strain can infect potato varieties as readily as did the typical strain of PVY, and he concluded that only a prior infection of the Potato with a common strain of the virus prevents heavy infection with (PVY - TVN). Kolokowski & Schmelzer (1960) stated that the necrotic strain induced symptoms on potato varieties same as did the typical Y-strain, although the symptoms produced by the (PVY-TVN) were usually milder than those produced by the type strain. Todd (1961) showed that symptoms produced on the potato variety Craige Royal as a result of (PVY - TVN) infection, consisted of mild mottling and vein - batching. Occasionally (PVY - TVN) did not produce any symptom on some potato varieties (Munster & Pelet, 1963 and Boilova - Yongluva, 1965).

Nicotiana tabacum L. especially the varieties White Burley and Samsun were considered important hosts in the identification of (PVY - TVN), because they develop characteristic symptoms (Klinkowski & Schmelzer, 1960). The common strain of PVY incited only vein-banding and mild mottle on this host (Dykstra, 1936). The necrotic strains induce necrosis on tobacco (Smith & Dennis, 1940). The first symptoms are confined to the smaller veins and then spread to cover all veins of the leaf. Finally the infected plants became severely stunted (Noberga & Silberschmidt, 1944). Samsun tobacco was very helpful in differentiating the type strain from the necrotic ones. The two groups initially induce vein-clearing and slight down-ward curving of the leaves, later, the necrotic strain produce in addition brownish necrotic lesion dispersed on the leaves (Klinkowski & Schmelzer, 1960). Many other workers had reported White Burley or Samsun tobacco as differential hosts (DE Bokx, 1961; Silberschmidt, 1960, Kahn & Monroe, 1963 and Baillova - Yongulova, 1965).

Ross (1953) used Physalis floridana as a local lesion host for PVI. Munro (1965) mentioned that Physalis floridana had proved useful in the differentiation among PVY isolates. Beemster (1957) and DE Bokx (1961) stated

that (PVY - TVN) induced mosaic and necrotic symptoms on that host.

Nicandra physaloides (L.) Gaertn. produced faint necrotic rings with green centres that eventually become dark when inoculated with (PVY - TVN), in addition it induced chlorotic spots on systemic leaves (Silberschmidt & Rostom, 1954). DE Bokx (1961) stated however, that this strain produced only mild mosaic on that host.

Solanum demissum and Hybrid A6 (S. demissum x S. tuberosum) were reported by (Kohler, 1953; DE Bokx, 1961, 1964, Wenzel, 1963, Hunnis et al, 1964, Munster & Cornu, 1966 and Keller&Berces, 1966) to be hypersensitive to all strains of PVY.

Easton et al (1958) mentioned that (PVY - TVN) induce severe symptoms on Capsicum spp., while others (Harvath, 1966, DE Bokx, 1961 and Kahn & Monroe, 1963) recorded no symptoms.

Nicotiana glutinosa L. and Petunia hybrida induced mosaic when inoculated with (PVY - TVN) (Roland, 1957, Noberga & Silberschmidt, 1944 and Kahn & Monroe, 1963).

Gomphrena globosa L. and Datura stramonium which proved to be susceptible to some strains of PVY (Paul, 1956 and Plank & Occonnor, 1952) were immune to (PVY - TVN) infection (DE Bokx, 1961 and Kahn & Monroe, 1963).

Delgado - Sanhez (1966), used Chenopodium quinoa as a local lesion assay host for Y-N, Y-L and Y-P strains of PVY.

Nobrega & Silberschmidt (1944), found that the (PVY - TVN) was inactivated when heated at 58°C. for 10 minutes and at a dilution of 1:1000 and it retained its infectivity when stored for 7 days at room temperature.

Derby & Larson (1951) studied the physical properties of 18 isolates of PVY. None of the isolates were infectious after heating for 10 minutes at 62°C.,whereas all survived at 54°C.. All isolates remained infectious for 6 days when stored In vitro at 20 - 22°C., but were inactivated after 18 days. Dilution end point was between 1:10,000 to 1:100,000.

Silberschmidt et al (1954) found that the thermal inactivation point of the strain which cause necrotic symptoms on White Burley tobacco plants lies between 55 - 60°C.

DE Bokx (1964) found that the Dutch strain of(PVY-PVN) had retained its infectivity in crude juice when stored for 22 days, but not after 29 days.

Darby et al (1951)and Ewston et al (1956) found that most strains of PVY collected from different countries were transmitted by sap inoculation to different hosts. Tobacco veinal necrosis strain was the only one which failed to infect potato plants mechanically. This agrees with the findings of Silbernschmidt (1950) who stated that although this strain has been transmitted to most of PVY hosts it was not easily transmitted by sap to potato varieties.

Aphid vectors of the virus:-

Apparentely Shultz & Folsom (1923) were the first to transmit PVY by aphids from potato plants with rugose mosaic symptoms (a complex of PVX and PVY). Koch (1933) could transmit rugose mosaic (PVY) from potato to tobacco by means of M. persicae sulz. and Macrosiphum solanifolii Ashm. However, he failed to transmit the disease to potato from either potato or tobacco plants. Watson & Roberts (1939), transmitted PVY by Myzus circumflexus Buckton, and Macrosiphum gei Koch. Lougnane (1939),used

Myzus ornatus Laeg., to transmit PVY to healthy plants. Bawden & Kassanis (1947), transmitted PVY from tobacco to tobacco by M. persicae, M. circumflexus, M. solani Kltb, Canariella postinacae and Macrosiphoniella sonhorni and to potato by M. persicae only.

Smith & Dennis (1940), failed to transmit the symptoms of tobacco veinal necrosis by M. persicae and Macrosiphum gei, but they transmitted the symptoms of vein-banding to White Burley by either aphid species.

Kassanis (1942), found that Aphis rhamni (Boyer,) transmitted PVY from tobacco to tobacco and from potato to potato. Nobrega & Silberschmidt (1944) and Orlando & Silberschmidt (1945) working on the necrotic strains of PVY, found that M. persicae and Macrosiphum solanifolii can transmit the virus to healthy plants and that the green peach aphid was the more effective vector.

Silberschmidt (1960), stated that White Burley tobacco plants inoculated by means of insects showed the same severe vein-necrosis symptoms characteristic of the source plant. M. persicae transmitted the virus from infected tobacco plants to more than 80 % of the inoculated plants of Eignhelmer potato variety and about 60 % of