POPULATION DYNAMICS OF *MYZUS PERSICAE* (SULZER) IN SPRING POTATOES AT SWABI

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Abstract

The present study was conducted to find out the population trends of Green peach aphid *Myzus persicae* (Sulzer) (Homoptera: Aphididae) on different potato varieties at the University of Swabi, during spring 2015. Five potato varieties namely NARC 2004-05, Stemto, Rosemara, VGBRer and Sarpomirawere tested in the field. Population of aphid was recorded at weekly intervals throughout the growing season. The results revealed that density of *M. Persicae* was highest on Rosemara variety with 5.69 aphid/plant and lowest on potato variety NARC 2004-05 with 3.47 aphid/leaf. *M. persicae* was consistently at different densities in different times on potato varieties. The aphid infestation started in all varieties with a mean density of 1.36 aphids/plant during 1st week of March 2015. The number of aphids steadily increased with significant differences till the 3rd observation (2nd week of March), where 3.46 aphid/plant were recorded. High mean population of 10.93 aphids/plant was recorded in the 4th week of March, followed by the mean number of 9.4 aphid/plant in the 3rd week of March. The decline in population started in the start of April. The period from 3rd to 4th week of March was found very critical and need special attention for the effective and timely management of the aphids.

Keywords: *Myzus persicae*, Green peach aphid, Potato, Population dynamics, Varieties, Aphids.

INTRODUCTION

The cultivated potato, (*Solanum tuberosum*) belongs to the family Solanaceae. Potato has become an important crop for both farmers and consumers in Pakistan because of its higher per unit production and net return. Potato crop is used for planting and nearly 80% is held or sold for food purposes. The potato crop is a rich source of starch and carbohydrates. The average whole potato consists of about 79% water, 1% ash, 2% protein, 0.1% fat, 0.6% crude fiber, and 17 - 18% starch, sugar and other carbohydrates. High starch content is associated with mealiness and good cooking quality (Akeley and Stevenson, 1943; Naz et al., 2011). Pakistan comprises of five broad geographic regions: the upper Indus plane, Baluchistan plateau, the Northern Mountains and the lower Indus plane (Ahmad, 1964). The Northern Mountain has the greatest diversity of Pakistan potato production zones. The summer crops in northern mountain is an important source of seed potatoes for the spring crop in the upper Indus plain. Potato is the
major cash crop of farmer in Hazara division of KPK where three crop of potato i.e. autumn, spring and early summer are grown (Geddes et al., 1989). While in main districts such as Swabi, Mardan and Charsadda farmers only go for the autumn crop because of the insect problem in spring potatoes (Ali et al., 2005).

The reduction of yield in potato crop involved certain factors including poor agronomic practices, various diseases like a variety of viral and fungal infestation which cause reduction of yield. Viral infection, particularly leaf roll (PLRV) & PVY are the most important disease. Other major disease include late blight (Phytophthora infestans), fungal wilts (Fusarium spp & Verticillium spp), powdery scab (Spongospora subspp), black scurf (Rhizoctonia solani), & certain mineral deficiencies like that of Zinc, Potash etc. Similarly numerous insect pests including aphids, cutworms, jassids, whiteflies, mites, white grub and potato flea beetles are also a major threat to the crop (Geddes et al., 1989). Among all these problems, aphid is one of the most vital pests' problem that play major role in the lower yield of potatoes in Pakistan. Aphids are small, soft-bodied insect with long, slender mouth parts that they use to pierce stem, leaves & other tender plant parts & suck out plant fluids.

The Myzus persicae (sulzer) (Hemiptera: Aphidiidae) is one of the major insect pest of potato crop and causes huge damages. Low number of leaf feeding by aphids are usually none damaging the crop. However, large population cause curling, yellowing and distortion of leaves and stunting of shoots. They can also produce large quantity of sticky exudates known as honey dew, which often turns black with the growth of a sooty mold fungus (Gildow, 1999). The life cycle of M. persicae may be holocyclic or anholocyclic. In temperate regions, where it often exhibits a holocycle (with an annual sexual phase), it alternates between a primary and secondary host. Eggs are laid in winter on the primary woody winter host peach, Prunus persica. The subsequent generations colonize the secondary hosts from various families such as Compositae, Cruciferae and Solanaceae (van Emden et al., 1969).

In the anholocyclic life-pattern, M. persicae overwinters as adults or nymphalapterous viviparous females. M. persicae also overwinters readily in sheltered situations such as glasshouses (Doncaster and Gregory, 1948; Broadbent, 1953) and in beet and potato clamps (Heie, 1954). In warm temperate and tropical regions, the hot dry season is no doubt the most hazardous period for survival, both in terms of scarcity of suitable host plants and temperature above 28 °C which prevents development (van der Plank, 1944), and in many such areas the aphid populations may die and be replaced annually by migrants from cooler moist regions, i.e. hills and mountains (Dickson and Laird, 1967).

Aphids can affect the health of the potato crop directly by feeding but the primary concern with aphids is their role as virus vector in transmitting several viruses, which reduce plant vigor and yield potential of seed tubers (Hills rislamber, 1972; hooker, 1986). These viruses cause molting, yellowing or curling of leaves and stunting of plant growth. They spread over long distance by wind born winged aphids between fields and over short distance by wingless aphids moving from plant to plant with in a field (Radcliffe et al., 1993). Since green peach aphids (Myzus persicae) brings the most efficient vector of viral disease, play a vital role in limiting diseases free potato production (Verma, 1977; verma, 1985).

No work has been conducted up till now in different potato varieties to know about the resistance and population trend of M. persicae in District Swabi area. Therefore, keeping in view the above mentioned problems and facts, this study was initiated to evaluate comparative resistance in different potato varieties and to determine the field population trend of M. persicae in different potato cultivars.

MATERIAL AND METHODS

An experiment was conducted in experimental farm of Agriculture Department, University of Swabi to determine the population trends of M. persicae in different potato varieties. Five potato varieties i.e., NARC 2004-05, Stemto, Rosmera, VGBRe and Sarpomira were sown in first week of February in Randomized Complete Block Design (RCBD), with three replications R1, R2 and R3 and each replication consisted of three rows of each variety and each row consisted of ten plants. Each plot has 3 rows of one variety of potato. Row to row distance was maintained as 70 cm and plant to plant distance was kept 30 cm as described by Ahmad et al., (2011). Plant emergence was completed in 20 to 25 days after
sowing. Two months before planting farm yard manure at the rate of 32 t/ha was incorporated into the field. At the time of sowing, di-ammonium phosphate (DAP) was applied at recommended rates and urea was applied at the rate of 170kg per ha after sowing of potato cultivars. Standard agronomic practices i.e. irrigation, hoeing, weeding and earthling-up were done as necessary and the field was left open for natural infestation of insect pests.

Randomized Complete Block Design (RCBD):

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Fifteen plants were selected; three plants from each variety were tagged. Aphids were counted on 3 days intervals from 15 randomly selected plants, 3 from each plot, from the date of start of initial aphid infestation up to harvest of the crop. The data was recorded on the same plants. The data were collected on the following parameters.

- To evaluate comparative resistance in different potato varieties.
- To determine the field population trend of *M. persicae* in different potato varieties.

**RESULTS AND DISCUSSION**

The data regarding mean number of aphid’s population densities, are given in Fig. 4.1 and Fig. 4.2 on five different potato varieties, at the experimental farm at University of Swabi, from 1st week of March to 3rd week of April 2015. Population of *M. persicae* was found to be at different levels among the varieties of potato over the period of data collection. *M. persicae* remained a regular pest with different densities throughout the growing season. The population density was highest during 3rd to 4th week of March from 5th to 8th observation.

Fig. 1 shows 1st and 2nd observation of population density of *M. persicae* in all varieties, which reveals that, the aphid was initially started during the 1st week of March 2015 with an average no of population of 1.36 aphids per leaf. The number of aphid steadily increased with no significant differences till the 2nd week of March in 3rd and 4th observation where 3.46 aphids/plant were recorded.

In 5th and 6th observation during 3rd week of March aphid population steadily increased in all varieties with a significant difference, where 9.4 aphids/plant were recorded. Similarly in 7th and 8th observation during 4th week of March a peak aphid population of 10.93 aphids per plant was recorded. The aphids’ population started declining from 9th to 10th observation during 1st week of April where decrease of 1.56 aphids/leaf was recorded. Finally it dropped to 0.36 aphid per plant during 2nd week of April. The period from 5th to 8th observation which represent 3rd and 4th week of March (as shown in Fig: 1) is very critical and need special attention for the management of the *M. Persicae*. The overall means of *M. Persicae* per plant on different potato varieties (as shown in Fig: 4.2) indicated that significantly high population of 5.69M. persicae per plant was recorded on Rosmera, the overall mean aphid population/leaf was 5.02, 5.25 & 3.47 on Sarpomira, Stemto, VGBRer and NARC 2004-05.

All these means were non-significant to each other but significantly lower than that of Rosmera. The data in Fig: 4.2 revealed that the Rosmera variety was most preferred by aphid followed by Sarpomira, Stemto, VGBRer and finally the NARC 2004-05 variety was least preferred by the aphid due to late germination.

Figure: 4.1 Weekly Mean number of *M. persicae* per potato plant, on five different potato varieties from March to April 2015.
DISCUSSION

During course of this research, different pest of potato crop was observed that causes piercing sucking injuries, are leafhoppers, chinch bugs and aphids. Among them aphid is one of the most important pests in different potato varieties in Experimental Farm, at University of Swabi. Our results are conformity with those of Gildow, 1999, Hills Rislamber, 1972 and Hooker 1986 reported that *M. Persicae* is one of major pests that affect the health of potato crop directly by feeding and produced a large quantity of sticky exudates known as honeydew, which turn back with the growth of sooty mold fungus. Kurol and Zontos (2006) who reported that the dominance of the aphid species into potato fields are *A. Nasturtli* 44%, *M. euphorbiae* 6%, *M.fragarae* 1% and *M. Persicae*49%. The results revealed that aphid specie *M. Persicae* (Sulzer) was found on potato crop. The aphid infestation started in all varieties in the 1stweek of March 2015. Aphid populations increased in early summer and then disappeared. The peak population density of *M. persicae* occurs in last two weeks of March and then declined down in 1st and 2nd weeks of April. The period from 2nd week of March to 3rd week of March was found very critical and need special attention for the effective and timely management of the aphid. Our results are confirmatory with Saljoqi, (2009) who observed that population density of *M. persicae* significantly increased during the first four weeks. Pest density steadily increased with significant differences till the 3rd observation (2nd week of March, 2006), where 3.42 aphid/ leaf were recorded. Pest population peaked during 3rd week of March with 4.22 aphid/ leaf. Pest density was highest during the 4th week after which it declined. The period from 2nd week of March to 3rd week of March was found very critical and need special attention for the effective and timely management of the aphid.

Among all the varieties, 2005-04 NARC and VGBRe showed comparatively high resistance due to late germination. Stemto and Sarpmirra were found to the most susceptible cultivar. Our result are in confirmatory with that of Saljoqi et al. (2003) whose screened different potato varieties against *Myzus persicae* and found Cardinal comparatively more resistance and Desiree the most susceptible variety among all use varieties. Numerous factors have been reported for the resistance of potato varieties against *M. persicae* including trichomes, visual cues and factors located on the plant surfaces and in subcutaneous tissues of potato cultivars Alvarez et al (2006). According to Raj and Verma (1989) population growth and development of *M. persicae* on potato in India highly fluctuated where its build-up was highest in early Rabi and lowest in Kharif. Weather conditions may be high influence on population dynamics of *M. persicae*. According to Rossi et al. (1990) Moerike’s traps; rainfall and high temperature had adverse effects on the population of *M. persicae*. In the interaction of treatments x time intervals, the aphid population increased with time up to week 4, when the highest population was recorded. Afterwards the pest population declined, perhaps due to poor foliar growth, very high temperature (30-38 °C) and bad weather conditions. These results agree with those of Houghes (1963) and Way (1968) and Saljoqi and van Emden (2003 b; c) who reported that plants become unsuitable for aphids, either by aging or by the damage inflicted by the insects and thus reproductive rate of the pest population declines. Our findings are also in agreement with the findings of Naeem (1996) who reported that both biological and physical factors could be responsible for the variation

Figure: 4.2  Mean *M. persicae* population per plant, on five different Potato varieties during March to April 2015.
in aphid’s population. They also stated that environmental factors (temperature, rain fall and humidity) and food availability greatly affect the population of aphids. These results are in consonance with the findings of Tobias and Olson (2006) who reported that aphid population was highest in early Rabi and lowest in kharif season. Environmental conditions especially rainfall and high temperature had adverse effects on the population of M. persicae. These results agree with the findings of Saljoqi and van Emden (2003) and Saljoqi (2009) who reported that with the aging the plants become unsuitable and thus reproductive capacity declines.Carter (1972) and Watt and Dixon. (1981) reported that sudden changes in the weather conditions and food quality could result in very poor survival of aphids.

CONCLUSIONS

Myzus persicae is the predominant specie of the potato aphid at University of Swabi, experimental field. The peak population of 10.93 aphids per plant attained during 4th week of Marchand lowest population of 1.03 aphids per plant attained during 2nd week of April. Myzus persicae attacked more on Rosemara variety because of its susceptible nature, while NARC 2004-05 variety is resistant one against its attack.

REFERENCES

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