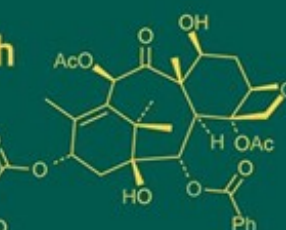
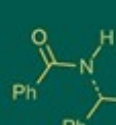


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Profiling of incidence of aphid (*Myzus persicae*) and whitefly (*Bemisia tabaci*) under nucleus seed production system in Gwalior region of Madhya Pradesh

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ABSTRACT

Field experiments were conducted in the experimental area of the ICAR-Central Potato Research Institute (Regional Station), Gwalior, Madhya Pradesh, during two rabi seasons, 2024-25 and 2025-26, under the agro-climatic and soil conditions of Madhya Pradesh to evaluate incidence of Aphid (*Myzus persicae*) and Whitefly (*Bemisia tabaci*) under nucleus seed production system. The spray schedule of the plant protection measures was followed on interval basis as per seed plot technique. In the third week of November, there was a higher occurrence of aphids in K. Chandramukhi (0.79 aphid/ 10 compound leaves) compared to the lowest infestation found in K. Lauvkar and Chipsona – 3 (0.33 aphid in both types). In the third week of January, the highest aphid population was observed in K. Bahar (1.88 aphid / 10 compound leaves), while the lowest infestation was seen in K. Lauvkar and Chipsona – 3 (1.17 aphid in both varieties). Regarding the whiteflies, in the third week of November, the highest infestation was recorded in K. Chandramukhi (0.83 whitefly/ 4 plants), with the minimum infestation found in Chipsona – 3 (0.54 whitefly/ 4 plants). However, by the third week of January, the whitefly population was at its lowest. Varieties such as K. Chandramukhi, K. Sindhuri, K. Surya, K. Pukhraj, K. Khyati, K. Bahar, and K. Sangam (0.04 whitefly/ 4 plants) experienced minimal whitefly infestation, while the other varieties showed no whitefly incidence. Throughout both seasons, the levels of aphid and whitefly infestation remained below the economic threshold level (ETL) due to the application of various plant protection measures following the standard seed plot technique.

Keywords: *Myzus persicae*, *Bemisia tabaci*, Potato, Vector incidence, Population dynamics

Introduction

Seed is the basic and vital input in agriculture and its timely availability in adequate quantity as per demand decides the strength and growth of agricultural economy in a country indicating the importance of seed in agricultural production system. There is limited accessibility of quality material in case of vegetatively propagated plants in India. Generally, tubers are used as seed in potato (*Solanum tuberosum* L.) which contribute to 40-50% of input cost (Sadawarti *et al.*, 2021) [1], overwhelming various problems like low multiplication rates, increased production cost, various seed borne diseases befitting the risk of degeneration over the years. Producing abundant potato crops in the field, just like with other plants, depends on utilizing top-notch seed potatoes. Because potatoes are grown through vegetatively, they are highly susceptible to fungal, bacterial, and particularly viral infections that can quickly degrade seed tubers, requiring replacement every four years. (Sadawarti *et al.*, 2021) [1]

Due to the advancements in Seed Plot Technique, there has been a notable shift in the production of disease-free seeds from hilly areas to flat plains. Although initially, potatoes were cultivated as a summer crop in hilly regions, they have now become a major winter crop in the plains. The fertile belt stretching from Punjab to Assam has benefited greatly from this technique, resulting in seed yields that are 30–40% higher and free from various soil and tuber-borne diseases. The key principle of this method involves cultivating healthy seed tubers by minimizing aphid infestations between October and early January, along with effective pest and disease control measures. It is essential to rogue and dehaulm the seed crop by the end of December or mid-January to prevent aphid infestations from reaching economic threshold level. This approach has created opportunities for producing high-quality seeds in the subtropical plains, allowing for expanded seed production in regions like Uttar Pradesh, Bihar, Punjab, Haryana, and parts of Madhya Pradesh (Singh *et al.*, 2024) [2].

Potato is infested by a number of aphids transmitting more than three dozen viruses, affecting the yield and quality. Peach-potato aphid *Myzus persicae* (Sulzer) is the most efficient aphid vector in potato (Bhatnagar *et*

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al., 2012) [3]. In addition, the cotton whitefly (*Bemisia tabaci*) is a major constraint for healthy seed potato production as it transmits the different of viral diseases in potato which results huge yield loss and degeneration of seed stocks. Currently, the management of vector-virus complex in potato depends on synthetic pesticides, in addition to the cultural practice of growing the crops during low aphid activity period (Sadawarti *et al.*, 2022) [4].

2. Materials and methods

The present experiment was laid out in the field of the experimental area of ICAR, Central Potato Research Institute – Regional Station (CPRI-RS), Gwalior, Madhya Pradesh, during two consecutive *Rabi* seasons (2024-25 and 2025-26). Where the treatments included different popular and new varieties of potato in a randomized block design (RBD) with 11 treatments *viz.* T₁- Kufri Chandramukhi, T₂- Kufri Jyoti, T₃- Kufri Sindhuri, T₄- Kufri Lauvkar, T₅- Kufri Chipsona -1, T₆- Kufri Chipsona -3, T₇- Kufri Surya, T₈- Kufri Pukhraj, T₉- Kufri Khyati, T₁₀- Kufri Bahar, T₁₁- Kufri Sangam and three replications. The topography of the experimental site was almost uniform, with adequate surface drainage. The experimental field was silty clay loam to silt loam with good drainage and lies 206 meters above sea mean level under subtropical climate and located at 26°13' N latitude and 78°14' E longitude. The area enjoying with extreme summer and winter (44.4 °C in summer and minimum 3.9°C in the winter). The annual rainfall ranges between 700 and 750 mm, most of which is received from the end of June to the end of September, with few showers in the winter months. For observations the number of Aphid (*Myzus persicae*) were taken from 10 compound leaves of 4 plants and Whitefly (*Bemisia tabaci*) were taken from 4 plants per plot one each from upper, middle and lower strata, preferably in the early morning hours. At weekly interval starting from third week of November (SMW – 47) to third week of January (SMW – 03). The spray of the plant protection measures was followed on interval basis, where first spray of pymetrozine 50 WG @0.06% (6g/10 lit of water) at 80% crop emergence, second spray of thiamethoxam 25WG @0.05% (5g/10 lit of water) after 10-15 days of first spray, soil application of cartap hydrochloride 4G @20 kg/ha during earthing up Third spray of imidacloprid 17.8 SL @ 0.03% (3 ml/10 lit of water) after 10-15 days of second spray. fourth spray of thiamethoxam 25WG @0.05% (5g/10 lit of water) after 10-15 days of third spray, fifth spray of imidacloprid 17.8 SL @ 0.03% (3 ml/10 lit of water) or thiamethoxam 25WG @0.05% (5g/10 lit of water) after 10-15 days of fourth spray was done as per seed production protocol (SPT) by ICAR- CPRI Shimla for maintaining the aphid and whitefly population below threshold level.

3. Results and discussion

The observation of aphid infestation recorded from mid-November to mid-January. This data was presented in Table - 1 and illustrated in Figure - 1. The incidence of aphids was at its minimum at the beginning of the crop cycle and gradually increased as the crop matured. In the third week of November (SMW - 47), the minimum aphid popula-

tion was recorded, with K. Chandramukhi observing the highest number of aphids (0.79), followed by K. Khyati (0.63) and K. Pukhraj (0.58). Conversely, the lowest infestation was noted in K. Lauvkar and Chipsona-3 (0.33 aphids in both varieties). By the third week of January (SMW - 03), the aphid population peaked, with K. Bahar (1.88 aphids) reporting the highest infestation, followed by K. Chandramukhi (1.83) and K. Khyati (1.79). Minimum infestation was again seen in K. Lauvkar and Chipsona-3 (1.17 aphids in both varieties). Historical data on aphid monitoring in the subtropical plains of India suggests that the population of *M. persicae* steadily increases until late December, crossing the threshold limit around that time, and then experiences rapid growth after late January, as reported by Kumar *et al.* (2024) [5]. The population of *M. persicae* increased steadily until rainfall events interrupted this trend, leading to exponential growth after the second week of January, according to Kumar *et al.* (2024) [5]. Kahar and Konar (2024) found results consistent with this study in their research on aphid occurrence among different potato germplasms/varieties in the plains of West Bengal. Sarjan and Nikmatulla (2020), Sadawarti *et al.* (2022) [4], Amlari *et al.* (2021) [6], and Reddy *et al.* (2025) [7] also reported a similar pattern of aphid occurrence as observed in this study. Aphid incidence was low in both seasons due to the application of various plant protection measures aimed at keeping aphid infestations below the Economic Threshold Level (ETL).

The observation of whitefly incidence was conducted from mid-November to mid-January, as shown in table - 2 and illustrated in figure - 2. The whitefly infestation was highest at the beginning of the crop cycle and gradually decreased as the crop matured. In the third week of November (SMW - 47), the highest whitefly population was recorded, with K. Chandramukhi detecting the maximum whiteflies (0.83), followed by K. Pukhraj (0.79). Chipsona – 3 had the lowest whitefly infestation recorded (0.54). By the third week of January (SMW- 03), the whitefly population was at its lowest, with K. Chandramukhi, K. Sindhuri, K. Surya, K. Pukhraj, K. Khyati, K. Bahar, and K. Sangam (0.04 whitefly) observing a higher number of whiteflies. Other varieties showed no whitefly infestation. The incidence of whiteflies and their flight activity was highest for the first 2–3 weeks in potato crops, thereafter the activity of whiteflies was considerably reduced. Similar trends have been reported by Kumar *et al.* (2023) [8]. Reddy *et al.* (2025) [7] studied the correlation between biophysical, biochemical, and weather factors with whitefly population per plant across different varieties. Bhatnagar *et al.* (2017) [9], Shah *et al.* (2019) [10], Amlari *et al.* (2021) [6], Sadawarti *et al.* (2022) [4], Shah *et al.* (2021) [11], and Reddy *et al.* (2025) [7] also noted similar patterns of whitefly population dynamics in their studies. The whitefly incidence was low in both seasons due to effective plant protection measures and proper insecticide application, ensuring that the whitefly population did not exceed the economic threshold level throughout the crop cycle.

Table 1. Aphid population pattern during crop season

Treatment	APHID INCIDENCE								
	SMW - 47	SMW - 48	SMW - 49	SMW - 50	SMW - 51	SMW - 52	SMW - 01	SMW - 02	SMW - 03
K. Chandramukhi	0.79	0.92	1.04	1.25	1.13	1.46	1.71	1.71	1.83
K. Jyoti	0.50	0.54	0.83	1.08	0.88	1.13	1.46	1.50	1.50
K. Sindhuri	0.54	0.63	0.92	1.17	1.08	1.21	1.42	1.67	1.71
K. Lauvkar	0.33	0.38	0.50	0.79	0.83	1.08	1.00	1.17	1.58
K. Chipsona -1	0.54	0.58	0.79	0.71	0.83	1.13	1.08	1.29	1.67
K. Chipsona -3	0.33	0.54	0.54	0.71	0.75	1.00	1.08	1.13	1.17
K. Surya	0.42	0.63	0.63	0.75	0.88	1.13	1.08	1.17	1.29
K. Pukhraj	0.58	0.71	0.75	0.88	0.83	1.25	1.13	1.38	1.46
K. Khyati	0.63	0.67	0.92	1.04	0.88	1.38	1.21	1.58	1.79
K. Bahar	0.46	0.71	0.75	1.21	1.29	1.54	1.38	1.71	1.88
K. Sangam	0.46	0.50	0.63	0.88	0.79	1.04	1.04	1.25	1.38
S.Em. ±	0.07	0.08	0.09	0.07	0.09	0.11	0.09	0.09	0.10
C.D. at 5%	0.20	0.24	0.26	0.20	0.25	0.33	0.25	0.26	0.28

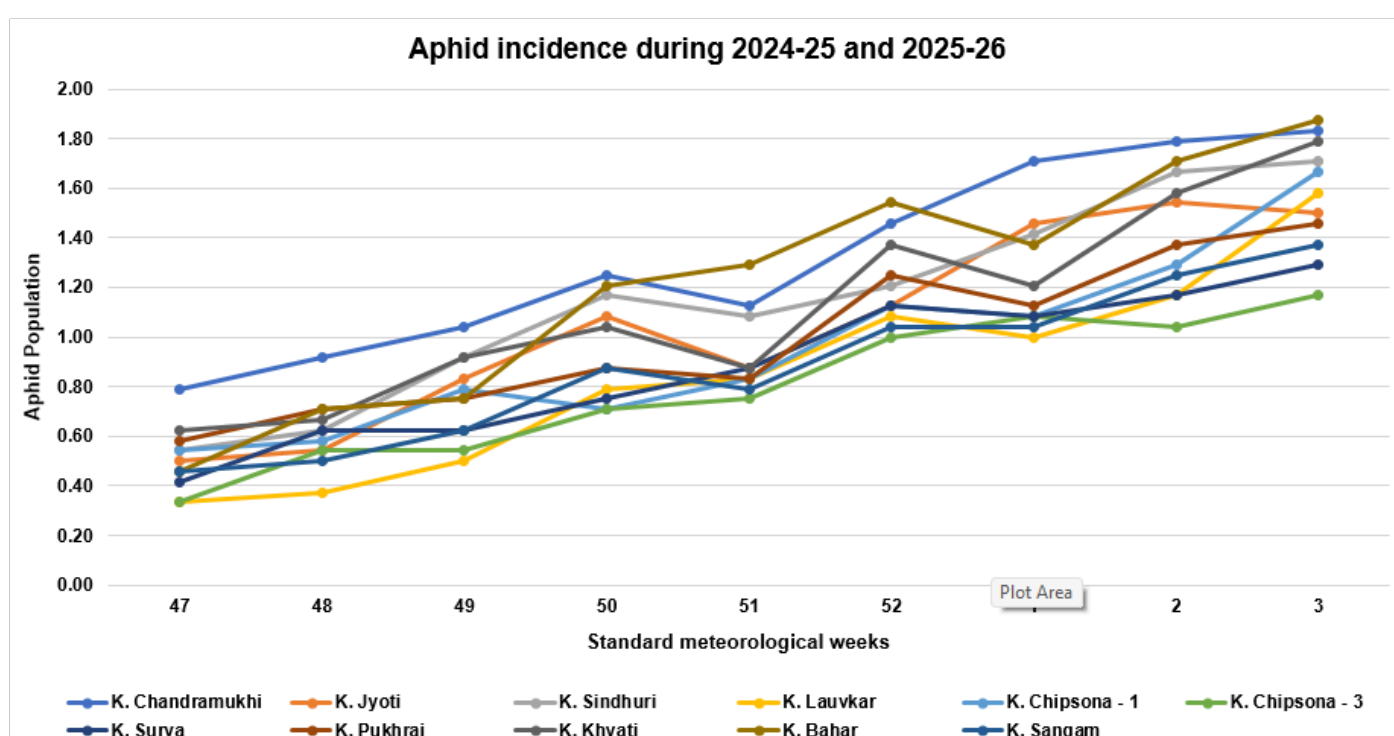
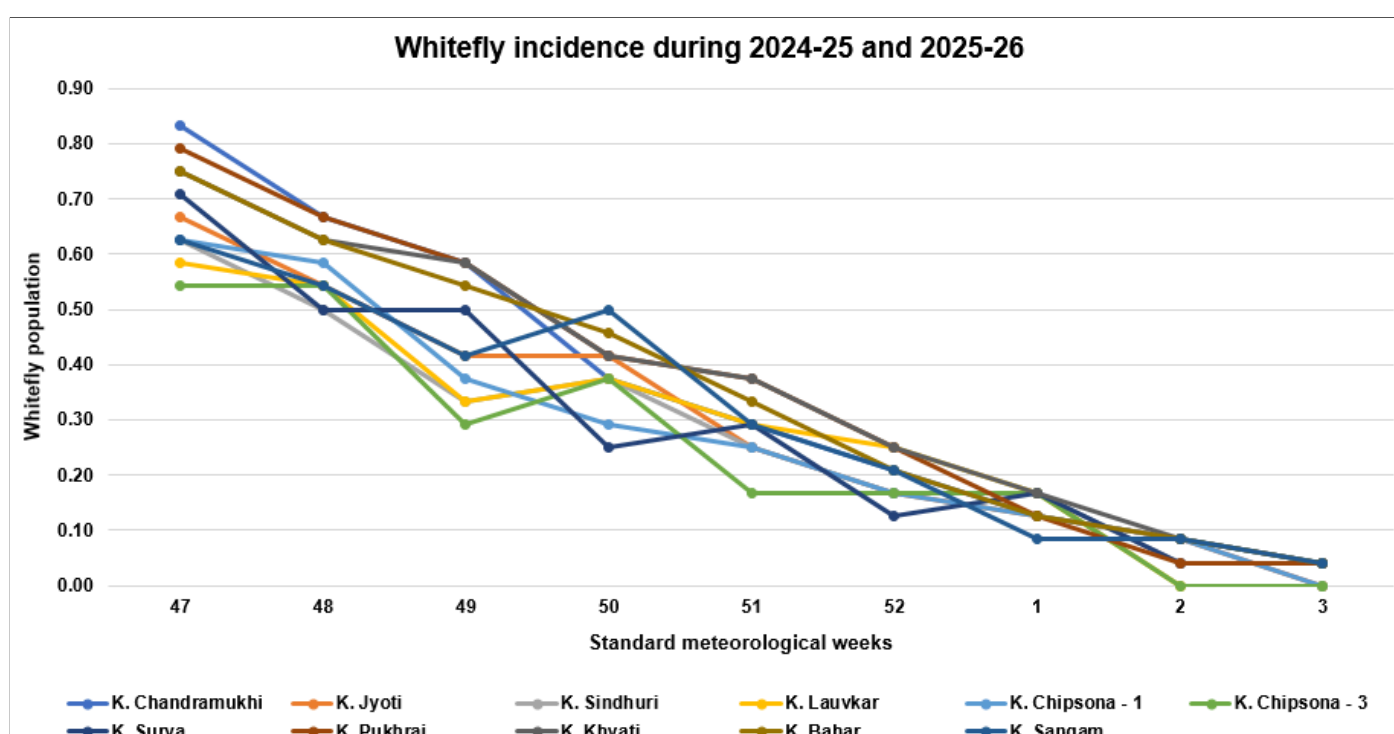


Figure 1. Aphid incidence during the crop growth period

Table 2. Whitefly population pattern during crop season

Treatment	Whitefly Incidence								
	SMW - 47	SMW - 48	SMW - 49	SMW - 50	SMW - 51	SMW - 52	SMW - 01	SMW - 02	SMW - 03
K. Chandramukhi	0.83	0.67	0.58	0.38	0.29	0.21	0.13	0.08	0.04
K. Jyoti	0.67	0.54	0.42	0.42	0.25	0.17	0.13	0.08	0.00
K. Sindhuri	0.63	0.50	0.33	0.38	0.25	0.17	0.17	0.04	0.04
K. Lauvkar	0.58	0.54	0.33	0.38	0.29	0.25	0.17	0.00	0.00
K. Chipsona -1	0.63	0.58	0.38	0.29	0.25	0.17	0.13	0.08	0.00
K. Chipsona -3	0.54	0.54	0.29	0.38	0.17	0.17	0.17	0.00	0.00
K. Surya	0.71	0.50	0.50	0.25	0.29	0.13	0.17	0.04	0.04
K. Pukhraj	0.79	0.67	0.58	0.42	0.38	0.25	0.13	0.04	0.04
K. Khyati	0.75	0.63	0.58	0.42	0.38	0.25	0.17	0.08	0.04
K. Bahar	0.75	0.63	0.54	0.46	0.33	0.21	0.13	0.08	0.04
K. Sangam	0.63	0.54	0.42	0.50	0.29	0.21	0.08	0.08	0.04
S.Em. ±	0.12	0.08	0.07	0.10	0.10	0.10	0.08	0.05	0.03
C.D. at 5%	0.34	0.23	0.21	0.29	0.29	0.29	0.24	0.13	0.09

**Figure 2.** Whitefly incidence during the crop growth period

The incidence in the third week of November of the aphid population recorded minimum and increased gradually. However, the highest number of aphids was seen during the third week of January. Whitefly numbers were at their peak in November's third week and decreased gradually. In contrast, in the third week of January, whitefly populations were at their lowest. Despite this, both aphid and whitefly populations remained below the economic threshold level (ETL) during both seasons due to different plant protection methods following the standard seed plot technique.

4. Conclusion

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