

## Survey and enumeration of aphid infestation on potatoes with the help of a yellow sticky trap and yellow water pan trap

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### Abstract

In a field trial, the infestation of aphids, *Myzus persicae* (Sulzer,1776) and *Aphis gossypii* Glover, 1877 (Aphididae: Hemiptera) was enumerated on Kufri Jyoti (cultivated variety of potato) by using yellow sticky trap and yellow water pan trap during *rabi* seasons from 2019-2020 to 2021-2022 at District Seed Farm, Department of Agriculture, Burdwan, West Bengal. Results revealed that initiation of aphid population was noticed in the crop field on or before 3rd week of December with the peak in 3rd week of February. However, the trapping level of the aphid population was not similar in the two types of trap. Though the aphid population in all the cultivars decreased gradually after the peak, the attainment of a higher population differs over the duration. The incidence pattern of aphids was slightly higher in the yellow sticky trap in comparison to the yellow water pan trap.

**Keywords:** aphid infestation, Kufri Jyoti, yellow sticky trap, yellow water pan trap.

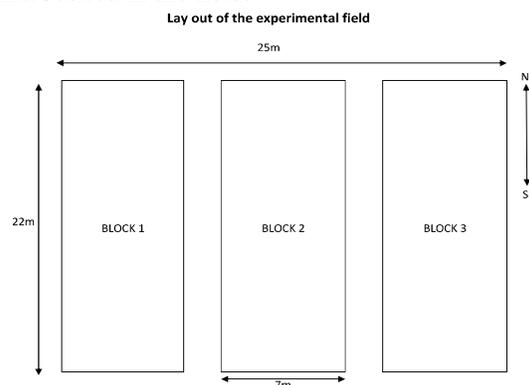
### 1. Introduction

Potato (*Solanum tuberosum* L.) plays an important role along with other essential vegetables in our daily diet. It grows all over the country under a wide range of agro-climatic conditions and secures fourth and third rank in the world [1] in the area (2.16 m ha) and production (53.04 mt), respectively, with the productivity of 24.56 t ha<sup>-1</sup> [2]. Varietal limitations along with pest and disease infestations are the major constraints for achieving higher production of potatoes. Near about 100 insect pests and non-insect pests all over the world were recorded to infest potato crops and of which two species of aphid namely *Myzus persicae* (Sulzer) and *Aphis gossypii* Glover (Aphididae: Hemiptera) found to be the most important sucking pest that not only causes damage by sucking plant sap, but also transmitting various potato viruses [3,4,5,6]. A thorough study regarding the incidence pattern of this pest by using a yellow sticky trap and yellow water pan trap on cv. Kufri Jyoti and the effect of

prevailing physical environment factors on population fluctuation of the pest is urgently needed [7] as they profoundly impact the survival, development, and population build-up of insect pests [8]. The knowledge in this line ultimately helps to formulate effective management strategies against the noxious sucking pests of potatoes and this was the major reason to focus the present study in this area of research.

### 2. Materials and Methods

The influence of different abiotic factors on the prevalence of aphids during potato growing season was studied for three consecutive years from 2019-20 to 2021-22 during *rabi* season (November to March) at District Seed Farm (situated at 23.2324° N latitude 87.8615° E longitudes and 30 m altitude above mean sea level) of the Department of Agriculture, Government of West Bengal, Burdwan, West Bengal with the help of yellow sticky trap and yellow water pan trap [9]. Kufri Jyoti was planted at the end of November in a separate field measuring 22m x 25m area. Three equal blocks (7m x 22m) were prepared in the specified area and the crop was planted with a spacing of 60 cm x 20 cm between row to row and plant to plant, respectively. All the recommended agronomic practices were strictly followed except the application of pesticides. When the initiation of the aphid population started, the traps *viz* yellow water pan trap and yellow sticky trap were introduced in the field.



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The sticky trap consisted of a small iron cylinder, measuring 24 cm in height and 14 cm in diameter, painted with yellow colour and was mounted vertically on an iron rod of 1.4 m in length. The outer surface of the cylinder was always smeared with transparent petroleum jelly which was renewed whenever necessary. Two such types of trap were used for the present experiment, which was placed in the potato field with its top about 1.2 m above the ground.

Two rectangular galvanized iron trays (45 cm x 30 cm x 10 cm), painted yellow on both the inner and outer sides, were used as yellow pan traps. Three-fourths of each pan or tray was filled with water, which was replaced every time just after taking the observation. These trays were kept in the potato field at a height of 15 cm above the ground but below the crop canopy. A few granules of phorate were always added as an insecticide in the water to kill the trapped insects to facilitate the correct counting of the leaves. The trapped aphids in both types of traps were collected every alternate day from December to March and the number was recorded periodically.



**Yellow sticky trap**



**Yellow water pan trap**

### 3. Results and discussion

The population dynamics of aphid were also registered with the help of a yellow water pan trap and yellow sticky trap for three consecutive years during *rabi* seasons (*i.e.* 2019-20 to 2021-22). The incidence pattern of the pest was more or less similar in both types of traps. But the number of winged aphids, caught in a sticky trap was significantly greater than in the water pan traps. The aphid population distinctly varied from one season to another. The mean aphid population of both types of traps was studied year-wise and has been presented in Table 1. Results revealed that in the 1<sup>st</sup> year (2019-20), the pest appeared in the traps during 2<sup>nd</sup> week of December. The population gradually increased and attained a peak in 3<sup>rd</sup> week of February (yellow water pan trap) and 2<sup>nd</sup> week of February (yellow sticky trap), respectively, and thereafter, the population of aphids gradually declined. During 2020-21, the pest infestation was initiated quite later *i.e.* 3<sup>rd</sup> week of December and reached the peak during 3<sup>rd</sup> week of February in the yellow water pan trap while in the yellow sticky trap the pest first appeared during the 2<sup>nd</sup> week of December and attained its peak during 3<sup>rd</sup> week of February. Afterward, the pest population started to decline. In 3<sup>rd</sup> year (2021-22) of the study, the aphid population in both traps was recorded since 3<sup>rd</sup> week of December, after which the population gradually increased and reached a peak in the middle of February and started to decline after that period.

The alate aphids appeared in the traps during the 2<sup>nd</sup> to 4<sup>th</sup> week of December and the population gradually increased to attain the peak between the 2<sup>nd</sup> and 4<sup>th</sup> week of February. Thereafter, the population started to decline and become nil in traps during late March. These findings confirmed the earlier reports of [10,11,12,13,14,15]. The present study also indicated that the aphid population was mainly dependent on temperature, humidity, and BSS. The effects of different weather parameters were not similar from one season to another. A little bit of similarity in the aphid population was found in 1<sup>st</sup> and 2<sup>nd</sup> year in yellow water pan traps while it was markedly different in the 3<sup>rd</sup> year. This was due to the fact that the climatic conditions of the 3<sup>rd</sup> year were distinctly varied from the previous two years. During 3<sup>rd</sup> year, winter came early in 1<sup>st</sup> week of December when the minimum temperature was 14.55°C compared to 19.83°C and

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16.44 °C in 1<sup>st</sup> and 2<sup>nd</sup> years. In addition to this, in 2021-22 the minimum temperature was lower along with very high humidity during the peak period (*i.e.* February) of pest population compared to the remaining two experimental years. It was observed that maximum temperature and BSS had little influenced when the minimum temperature was below 15°C and under this condition, humidity played an important role together with temperature. These results are in conformity with the findings of several workers [16,17,18,19,20,21].

Table 1. Mean aphid population of potato in Yellow pan trap and Yellow sticky trap during three consecutive potato growing seasons

Year	Month	Weekly average	Mean no. of aphid population	
			Yellow pan trap	Yellow sticky trap
2019	December	1 <sup>st</sup> Week	0	0
		2 <sup>nd</sup> Week	24	27
		3 <sup>rd</sup> Week	75	93
		4 <sup>th</sup> Week	148.5	154.5
2020	January	1 <sup>st</sup> Week	223.5	195
		2 <sup>nd</sup> Week	247.5	279
		3 <sup>rd</sup> Week	343.5	355.5
		4 <sup>th</sup> Week	378	412.5
2020	February	1 <sup>st</sup> Week	426	462
		2 <sup>nd</sup> Week	483	645
		3 <sup>rd</sup> Week	514.5	544.5
		4 <sup>th</sup> Week	448.5	519
2020	December	1 <sup>st</sup> Week	0	0
		2 <sup>nd</sup> Week	0	4.5
		3 <sup>rd</sup> Week	34.5	33
		4 <sup>th</sup> Week	100.5	108
2021	January	1 <sup>st</sup> Week	219	210
		2 <sup>nd</sup> Week	229.5	307.5
		3 <sup>rd</sup> Week	321	385.5
		4 <sup>th</sup> Week	373.5	448.5
2021	February	1 <sup>st</sup> Week	417	478.5
		2 <sup>nd</sup> Week	481.5	589.5
		3 <sup>rd</sup> Week	556.5	618
		4 <sup>th</sup> Week	421.5	429
2021	December	1 <sup>st</sup> Week	0	0
		2 <sup>nd</sup> Week	0	0
		3 <sup>rd</sup> Week	6	12
		4 <sup>th</sup> Week	70.5	103.5
2022	January	1 <sup>st</sup> Week	181.5	234
		2 <sup>nd</sup> Week	253.5	319.5
		3 <sup>rd</sup> Week	303	414
		4 <sup>th</sup> Week	352.5	447
2022	February	1 <sup>st</sup> Week	471	462
		2 <sup>nd</sup> Week	504	564
		3 <sup>rd</sup> Week	481.5	594
		4 <sup>th</sup> Week	439.5	478.5

### 4. Conclusion

The incidence pattern of aphid throughout the potato growing season was observed using yellow sticky trap and yellow water pan trap in cv. Kufri Jyoti. The alate aphids were first appeared in the traps during 2<sup>nd</sup> to 4<sup>th</sup> week of December with a peak in between 2<sup>nd</sup> and 4<sup>th</sup> week of February. The incidence pattern of aphid was slightly higher in a

yellow sticky trap in comparison to the yellow water pan trap.

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### References

- [1] R Pandey, M K Rai, K Sharma, and D Chaudhari, Studies on population dynamics of *Myzus persicae* on potato crop with special reference to its relation with various weather parameters. *Vegetable Science*, 34(2), 167-169 (2007).
- [2] Indian Horticulture Database, Ministry of Agriculture, Govt. of India 85, Instit.Area, Sector - 18, Gurgaon - 122 015 (2019).
- [3] A Konar, S Paul, and M Chettri, Efficacy of synthetic insecticides, biopesticides and azadirachtin against aphids on potato in West Bengal. Abstract of the National Symposium on "Assessment and Management of Bioresources", University of North Bengal, Darjeeling, West Bengal, India, May 29-30, 30 (2003).
- [4] A Konar, and S Paul, Population build up of aphids on different potato genotypes in gangetic plains of West Bengal. In: National Symposium on "Aphids in Agriculture and Forestry", University of Kalyani, Nadia, West Bengal, India, November 24-25, 28 (2004).
- [5] S R Dharpure, Effectiveness of botanicals and ethophonprox with phorate against *Myzus persicae* in seed potato production. *Journal of the Indian Potato Association*, 29, 55-59 (2002).
- [6] A Bhatnagar, A K Somani, and S Chander, Build up of *Myzus persicae* and development of mosaics on potato in central India. *Potato Journal*, 39, 208-210 (2012).
- [7] G M Aheer, M Saeed, Z U Shah, M Munir, and A Ali, Screening of potato varieties/advanced lines against potato aphid, *Myzus persicae* (Sulz.). *Journal of Agricultural Research*, 43, 269-271 (2005).

- [8] P S Shera, V Kumar, and A Aneja, Seasonal Abundance of Sucking Insect Pests on Transgenic *Bt* Cotton vis-à-vis Weather Parameters in Punjab, India. *Acta Phytopathologica et Entomologica Hungarica*, 48 (1), 63–74 (2013).
- [9] Lu Y, Bei Y, Zhang J. Are yellow sticky traps an effective method for control of sweetpotato whitefly, *Bemisia tabaci*, in the greenhouse or field? *J Insect Sci.* 12:113, (2012) doi: 10.1673/031.012.11301. PMID: 23445077; PMCID: PMC3620036.
- [10] R. Kishore, and K D Verma, Weather factors in relation to *Myzus persicae* (Sulzer) build up on potato crop. *Journal of Aphidology*, 1, 58-63 (1987).
- [11] Md. Mohasin, and B K De, Population build up of aphid vector in potato in the plains of West Bengal. *Environment and Ecology*, 11, 269-272 (1993).
- [12] N S Bhadauria, N K S Bhadauria, and S S Jakhmola, Seasonal incidence of potato aphid, *Myzus persicae* (Sulz.) in north-east Madhya Pradesh. *Advances in Plant Sciences*, 11, 59-61 (1998).
- [13] S S Misra, and H O Agrawal, Potato pests in India and their control. *Tropical pest Management*, 34, 199-209 (1998).
- [14] A Konar, and A Basu, Build up of aphids on potato in Hooghly district of West Bengal. *Potato Global Research and Development*, 1, 477-479 (1999).
- [15] S Paul, and A Konar, (2003). Integrated pest management of aphids of potato in gangetic plains of West Bengal. Proceeding of the National Conference on “Recent Environment Changes – Impact of Health, Agriculture and Ecosystem”. University of Kalyani, Kalyani, Nadia, West Bengal, India, August 6-7, 26-29 (2003).
- [16] R K Kashyap, and O P Bishnoi, A climatic approach for forecasting *Myzus persicae* on crop of seed potato (*Solanum tuberosum*) at Hisar. *Indian Journal of Agricultural Sciences*, 58, 374-377 (1998).
- [17] M M Rossi, J C Matioli, and C F Carvalho, Effects of climatic factors on some aphid species (Homoptera: Aphididae) on potato in Lavras-M G. *Anaisda Sociedade Entomologica do Brasil*, 19, 75-86 (1990).
- [18] E Pojnar, J Acremowicz, T Kobylko, M Lech, M A Mikulska, and A Pindel, (1991). The effect of microclimatic conditions (temperature and Precipitation) on the number of aphids and dissemination of viral diseases in potatoes depending on the source of infection. *Zeszyty Naukowe Akademii Rolniczej im. Hugona Kollataja w Krakowie, Ogronictwo*, No. 19, 27-43 (1991).
- [19] B S Nandihalli, and B V Patil, (1992). Impact of certain abiotic factors on the population on the population fluctuation of potato aphid, *Myzus persicae* Sulzer. *Madras Agricultural Journal*, 79, 290-294 (1992).
- [20] T P Trivedi, S M P Khurana, S N Puri, L M Bhar, S C Mehta, R C Jain, G Singh, S M Chaudhari, Md. Mohasin, A Dhanadapani, and N Chona, (2002). Development of forewarning system of potato aphid (*Myzus persicae*) on potato (*Solanum tuberosum*) in India. *Indian Journal of Agricultural Sciences*, 72, 341-345 (2002).
- [21] M K Biswas, P S Nath, B K De, and Md Mohasin, Effect of the application of insecticides on the incidence of aphids and spread of virus diseases of potato in the plains of West Bengal. *Journal of Interacademia*, 8, 27-32 (2004).