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Effects Of Selected Pesticides Such As: Acephate, Acetamiprid And Imidacloropid On Enzyme Activity Of Urease Enzyme In Soil Of Aligarh Region (U.P) India

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ABSTRACT

Pesticides are widely used for crop production because to prevent plant diseased, weeds, pests and to enhance the quality of the food products. Pesticides collected from Merck Mumbai. Such as Acephate, Acetamiprid and Imidacloprid were selected for the present study in order to determine their effects on the activities of soil enzyme urease.

Results observed that the effects of selected pesticides on enzyme activity of urease enzyme flabbily decrease while without pesticides enzyme activity of urease enzyme flabbily increase

Key words: Soil, Acephate, Acetamiprid, Imidacloropid and urease enzyme.

INTRODUCTION

Urease enzyme is responsible for the hydrolysis of urea fertiliser applied to the soil into NH_3 and CO_2 with the concomitant rise in soil pH[1]. This, in turn, results in a rapid nitrogen loss to the atmosphere through NH_3 volatilisation[2]. Due to this role, urease activities in soils have received a lot of attention since it was first reported by[3] a process considered vital in the regulation of nitrogen supply to plants after urea fertilization.

Structure of Urease Enzyme

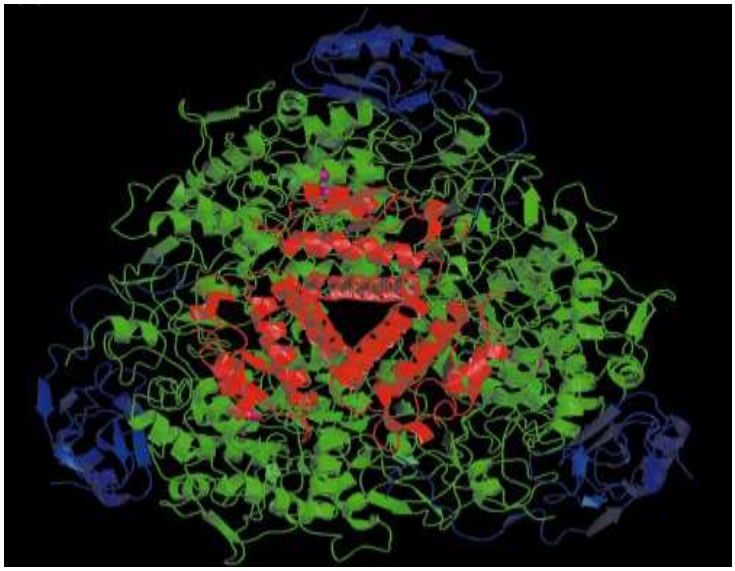


Fig. : Structure of urease enzyme

Mechanism of Urease Enzyme

Urease catalysed the hydrolysis process of urea converted to carbon dioxide & ammonia. It is found mainly in seeds, microorganisms and invertebrates. In plants, urease is a hexamer – it consists of six identical chains and is located in the cytoplasm. In bacteria, it consists of either two or three different subunits. For activation, urease needs to bind two nickel ions per sub unit

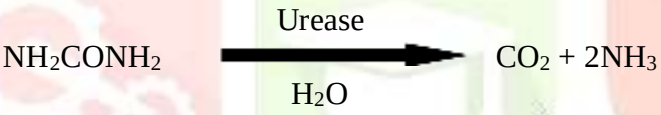
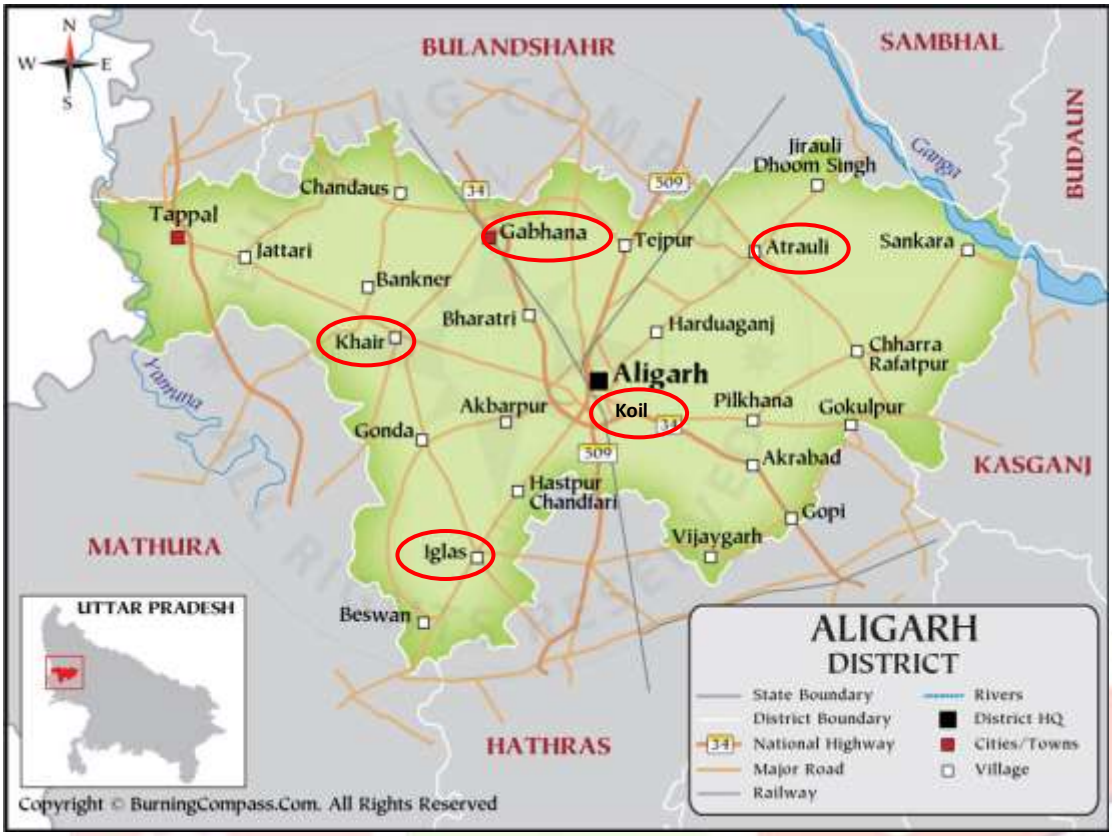


Fig. : Mechanism of Urease enzyme

METHODS

Soil

The soil pertaining to the experimental setup was collected from the region of Aligarh (Atrauli, Gabhana, Iglas, Khari and Koil) in summer season (June 2022). The soil collected was sieved through 2 mm mes before its transportation to the laboratory and stored at room temperature.



Site Map

ANALYTICAL PROCEDURES

Enzymatic activity

- To determine the urease activity, 0.03 M N-x-benzoyl-1-argininamide (BAA) and 6.4% urea, respectively, were used as substrates. The ammonium released by the two hydrolytic reactions were measured by an ammonium selective electrode.[4]

STATISTICAL ANALYSIS

Data were analyzed using statistical analysis of all the results reported are the means of the three replicates one way analysis of–variance (ANOVA) were done using the INDOSTAT programme and graph represent by MATLAB.

RESULTS AND DISCUSSION

Effects of selected pesticides on enzyme activity of urease enzyme in soil of Aligarh region (Atrauli, Gabhana, Iglas, Khair and Koil) were observed in the present study, facts are shown below.

Table 1 : Urease Activity of Atrauli in summer season (June 2022) (µg ammonia g^{-1} hr^{-1})

Sample code	Treatment Name	Replicates	Activity	Mean	Mean ± Standard Deviation
1	S	1	40.61	38.95	38.95 ± 1.23
		2	38.63		
		3	37.63		
2	Sa	1	32.26	32.24	32.24 ± 0.02
		2	32.21		
		3	32.25		
3	Sb	1	35.96	35.62	35.62 ± 0.49
		2	35.98		
		3	34.93		
4	Sc	1	27.94	28.54	28.54 ± 0.53
		2	29.25		
		3	28.45		

S = soil;
Sa = soil + acephate pesticide;
Sb = soil + acetamiprid;
Sc = soil + imidacloprid.

Figure 1 : Urease Activity of Atrauli in summer season (June 2022) (µg ammonia g^{-1} hr^{-1})

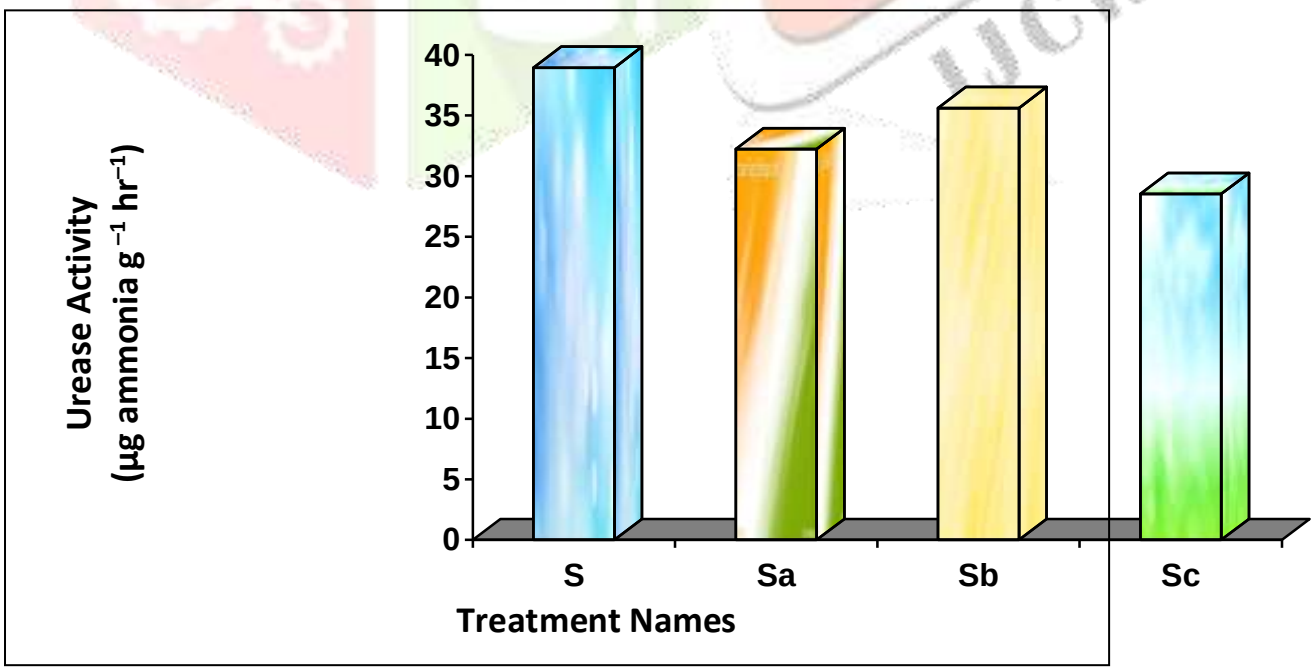


Table 2 : Urease Activity of Gabhana in summer season (June 2022) (µg ammonia g^{-1} hr^{-1})

Sample code	Treatment Name	Replicates	Activity	Mean	Mean ± Standard Deviation
1	S	1	29.98	29.19	29.19 ± 0.57
		2	28.97		
		3	28.63		
2	Sa	1	25.66	25.66	25.66 ± 0.26
		2	25.98		
		3	25.34		
3	Sb	1	24.65	24.65	24.65 ± 0.26
		2	24.98		
		3	24.34		
4	Sc	1	27.80	27.42	27.42 ± 0.49
		2	26.73		
		3	27.75		

S = soil;
Sa = soil + acephate pesticide;
Sb = soil + acetamiprid;
Sc = soil + imidacloprid.

Figure 2 : Urease Activity of Gabhana in summer season (June 2022) (µg ammonia g^{-1} hr^{-1})

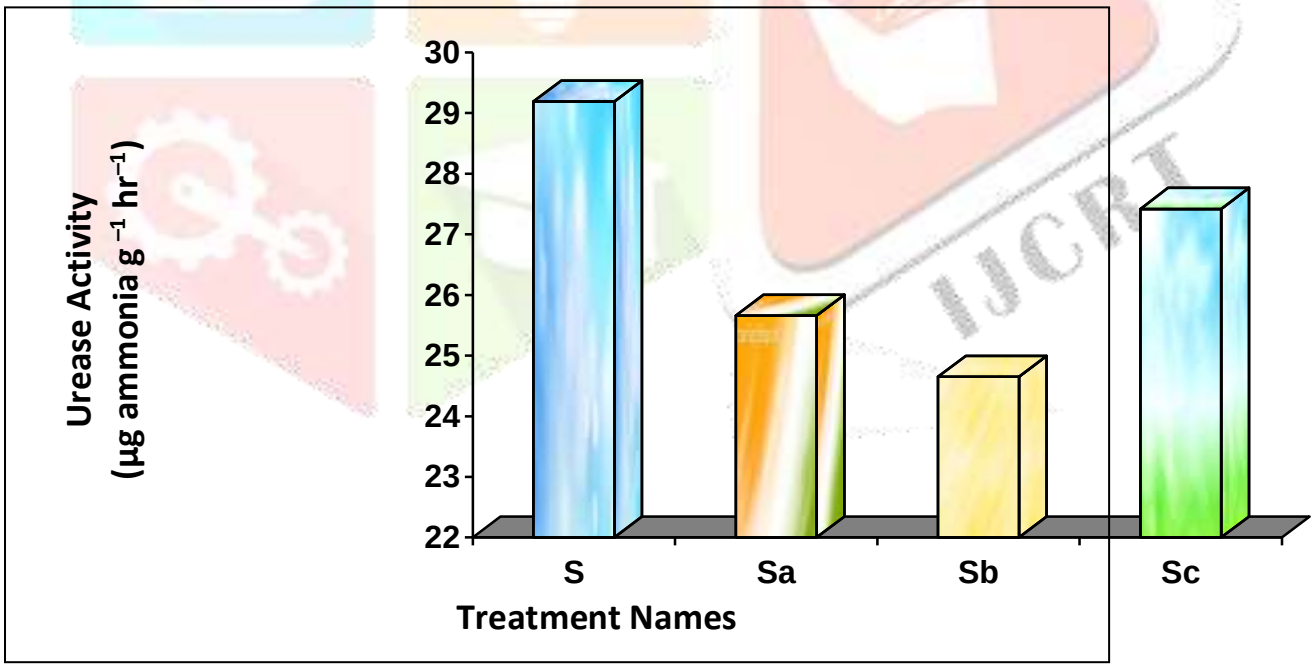


Table 3 : Urease Activity of Iglas in summer season (June 2022)

(µg ammonia g $^{-1}$ hr^{-1})

Sample code	Treatment Name	Replicates	Results	Mean	Mean ± Standard Deviation
1	S	1	38.45	38.76	38.76 ± 0.59
		2	39.60		
		3	38.25		
2	Sa	1	30.26	30.11	30.11 ± 0.40
		2	30.53		
		3	29.56		
3	Sb	1	35.46	35.45	35.45 ± 0.83
		2	36.47		
		3	34.43		
4	Sc	1	28.93	29.52	29.52 ± 0.22
		2	29.30		
		3	29.45		

S = soil;
Sa = soil + acephate pesticide;
Sb = soil + acetamiprid;
Sc = soil + imidacloprid.

Figure 3 : Urease Activity of Iglas in summer season (June 2022)
(µg ammonia g $^{-1}$ hr^{-1})

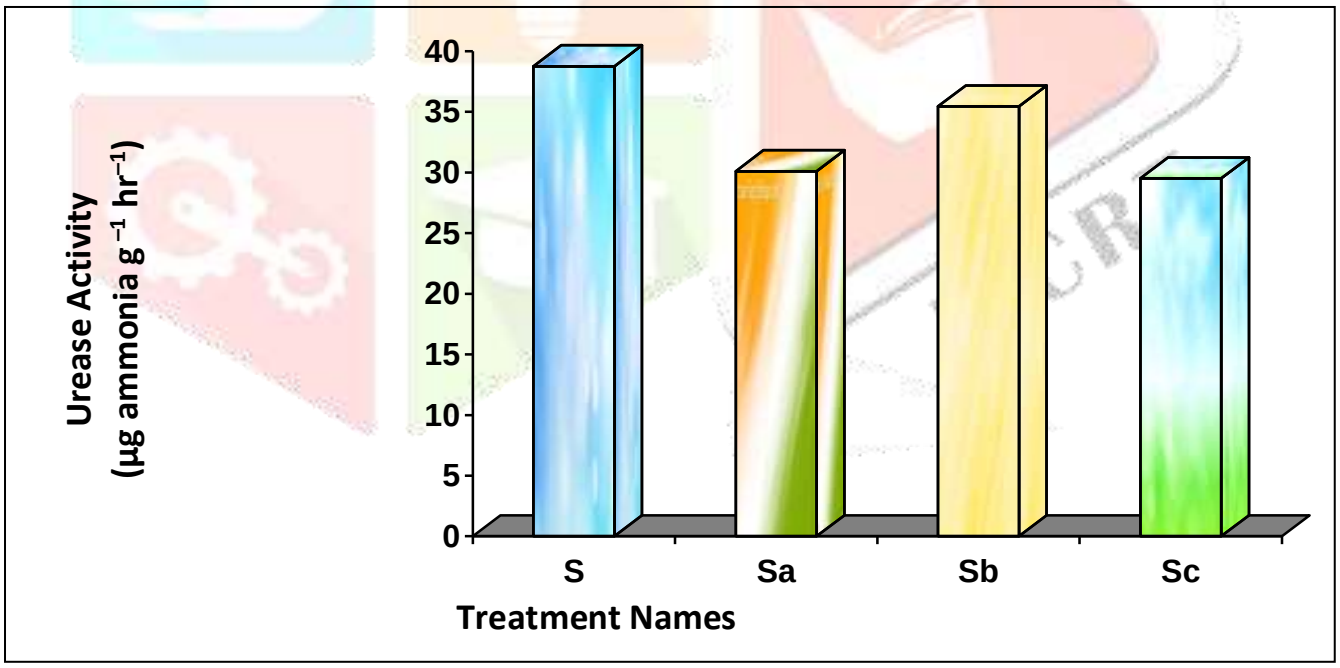


Table 4 : Urease Activity of Khair in summer season (June 2022) (µg ammonia g^{-1} hr^{-1})

Sample code	Treatment Name	Replicates	Results	Mean	Mean ± Standard Deviation
1	S	1	26.52	26.66	26.66 ± 0.11
		2	26.68		
		3	26.80		
2	Sa	1	25.44	25.08	25.08 ± 0.53
		2	25.48		
		3	24.32		
3	Sb	1	20.5	20.01	20.01 ± 1.25
		2	18.34		
		3	21.36		
4	Sc	1	25.65	24.40	24.40 ± 0.98
		2	23.25		
		3	24.30		

S = soil;
Sa = soil + acephate pesticide;
Sb = soil + acetamiprid;
Sc = soil + imidacloprid.

Figure 4 : Urease Activity of Khair in summer season (June 2022) (µg ammonia g^{-1} hr^{-1})

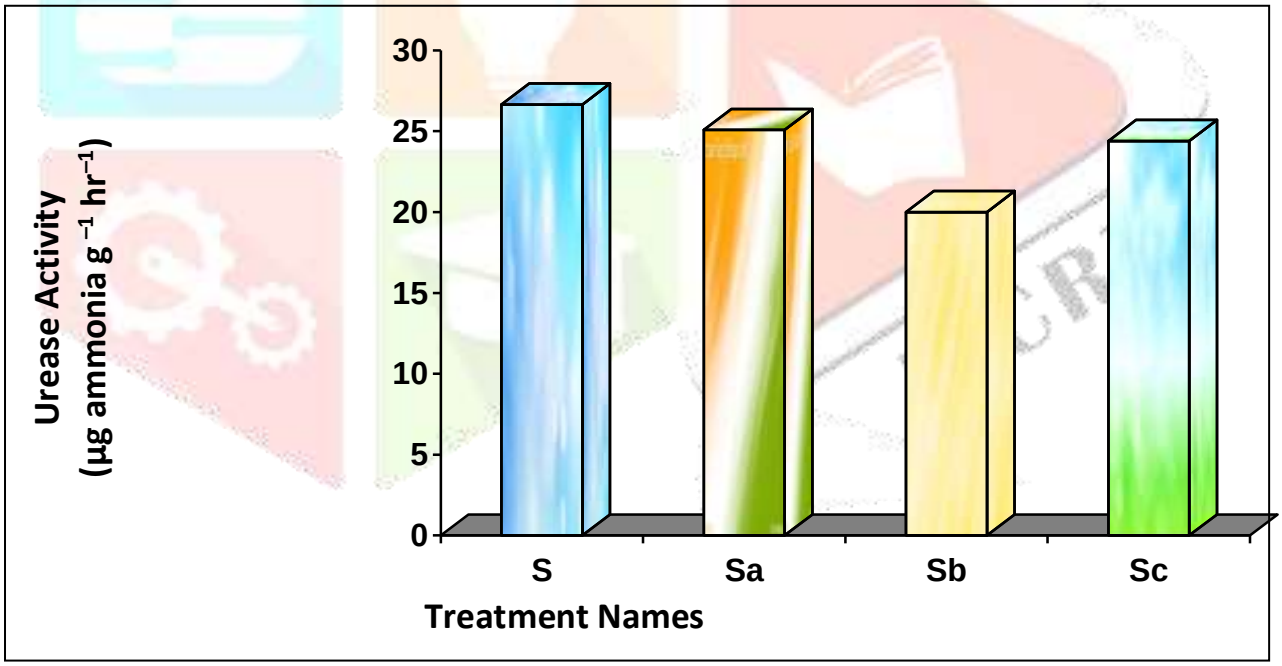


Table 5 : Urease Activity of Koil in summer season (June 2022)

(µg ammonia g $^{-1}$ hr^{-1})

Sample code	Treatment Name	Replicates	Results	Mean	Mean ± Standard Deviation
1	S	1	39.60	38.62	38.62 ± 0.80
		2	38.63		
		3	37.63		
2	Sa	1	31.26	31.45	31.45 ± 0.13
		2	31.53		
		3	31.56		
3	Sb	1	35.98	35.85	35.85 ± 0.14
		2	35.93		
		3	35.65		
4	Sc	1	28.94	28.88	28.88 ± 0.32
		2	29.25		
		3	28.45		

S = soil;
Sa = soil + acephate pesticide;
Sb = soil + acetamiprid;
Sc = soil + imidacloprid.

Figure 5 : Urease Activity of Koil in summer season (June 2022)
(µg ammonia g $^{-1}$ hr^{-1})

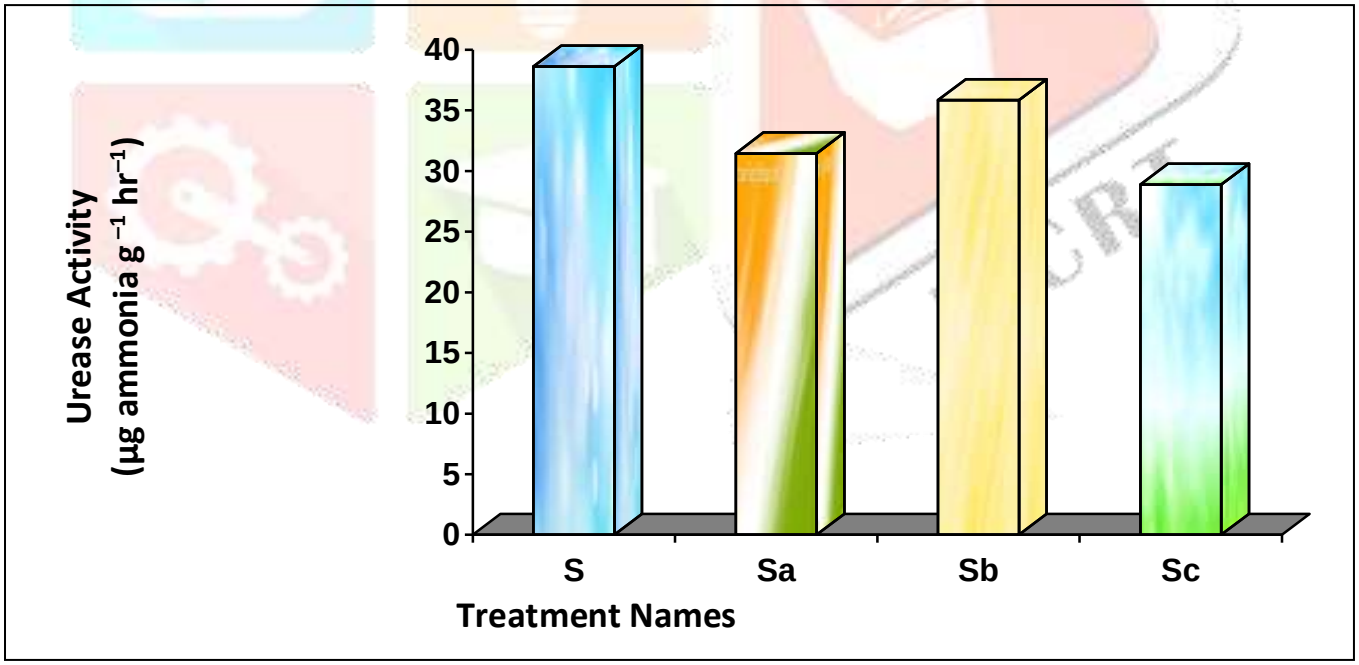
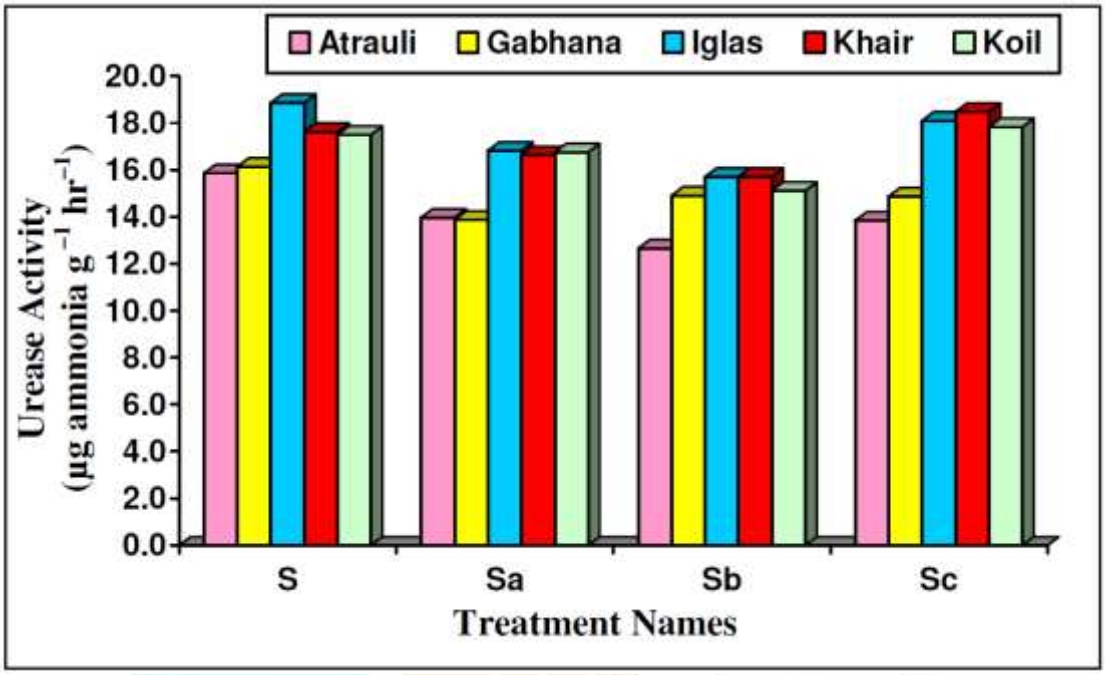


Figure 6 : Sampling Time June 2022 urease activity of Atrauli, Gabhana, Iglas, Khair and Koil in summer season
(µg ammonia g^{-1} hr^{-1})



CONCLUSION

The study demonstrates that the effects of selected pesticides on enzyme activity of urease enzyme in soil of Aligarh region in summer season (Atrauli, Gabhana, Iglas, Khari and Koil) flabbily decrease as compared to without pesticides in soil of Aligarh region. The effects of imidacloprid pesticides on soil enzyme activity decrease of urease as compared to acetamiprid and acephate pesticides.

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