**Effect of Irrigation Schedules and Cow Urine Spray on Density and Dry Biomass of *Vicia Sativa* in Wheat**

**ABSTRACT**

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| --- |
| **Aims:** To study the combined effect of irrigation scheduling and cow urine on weed dynamics **Place and Duration of Study:** A field experiment was conducted in the rabi 2019-20 and 2020-21 on the research farm of the Institute of Agricultural Sciences, Banaras Hindu University, Varanasi.  **Methodology:** The experiment was laid out in a split-plot design with three main plots, seven subplots, and that was replicated thrice. The main plot factors were I1-Irrigation Water (IW)/Cumulative Pan Evaporation (CPE) 0.7, I2-IW/CPE 1.0, and I3-IW/CPE 1.2. The subplots were C1: Control, C2: spray of cow urine at the CRI stage of wheat, C3: spray of cow urine at the CRI + tillering stage of wheat, C4: spray of cow urine at the CRI + tillering + late jointing stage of wheat, C5: spray of cow urine at the CRI + tillering + late jointing + flowering stage of wheat, C6: spray of cow urine at the CRI + tillering + late jointing + flowering + milking stage of wheat, and C7: spray of cow urine at the CRI + tillering + late jointing + flowering + milking + maturity stage of wheat. Each treatment received a total quantity of 4000 liters of cow urine per ha; for example, C3 had cow urine spray at the CRI stage and tillering stage of wheat. So cow urine is applied in C3 treatment as follows: at the CRI stage @ 2000 liters per ha and at the tillering stage @ 2000 liters per ha. The observations were recorded on the basis of various aspects pertaining to the density and dry biomass of Vicia sativa. The data were analyzed using analysis of variance (ANOVA), and the means were interpreted by the least significant difference (LSD) test at the 5% level.  **Results:** Irrigation schedules and cow urine spray did not show any significant effect on the density and dry biomass of Vicia sativa at various growth stages of wheat during both study periods. In the case of irrigation schedules, the lowest density of Vicia sativa was noted under the I3 s at 30 days after sowing in both years of the experiment. Hence the lowest density of Vicia sativa was noted under I3   in the first year and I1 at 60 and 90 days after sowing during both the study period. The maximum density of Vicia sativa was recorded under I2 at 30 and 60 days after sowing in both years of the experiment. In case of irrigation schedules, the minimum dry biomass was noted under I1 at 30 days after sowing in both years of the experiment. However, the utmost dry biomass of Vicia sativa was recorded under I3 in the first year and I1 during the second year at 60 and 90 days after sowing of the experiment. In the case of cow urine, the lowest dry biomass of Vicia sativa was found under C2 at 30 days after sowing during both years of the experiment. However, at 60 days after sowing, the minimum dry biomass of Vicia sativa was noted under the C3 in the first year and C5 in the second year. Hence, at 90 days after sowing of the experiment, the minimum dry biomass of Vicia sativa was observed under C4 during both years of the experiment.  **Conclusion:** The result revealed that the density and dry biomass of *Vicia sativa* were not significantly influenced by irrigation schedules and cow urine spray at different intervals during the both year of the experiment |

**Key Words:** Irrigation Schedules, Cow Urine, Dry, Biomass, Weed, Density, Experiment,

# 1. Introduction

Wheat is one of the most important cereal in the world. In India, wheat is the second most important staple cultivated food after rice and is consumed by nearly 65% of the Indian population and ranks first in dietary shares in northern India represented by Gangetic plains (Aher et al., 2022). Presently, wheat accounts for 96.64 MT. The productivity of the wheat depends upon a number of factors like crop establishment techniques, weed management, irrigation, cultural practices, fertilizer management, and others. Amongst these factors, the hidden war with crops starts with weeds, and it caused up to 90% breakdown of the crop (Dotaniya et al., 2020; Khandagle et al., 2019a; Yashona et al., 2020). According to world estimates, about 50% of losses in crop yield are due to different abiotic stresses under changing climatic conditions. The current weed problem has been aggravated due to the cultivation of high-yielding dwarf varieties, the use of high doses of fertilizers, frequent irrigation, and an increase in cropping intensity. But the growth in production has led to India now being the world’s second largest producer of wheat. However, the concept of organic farming has been gaining momentum with the use of different manures, as the liquid organic manures can help to maintain optimum crop yield by maintaining the fertility status (Mandale et a., 2019; Khandagle et al., 2019b; Aher et al., 2019; Mandale et al., 2018). The integrated use of inorganic fertilizers with the liquid organic manures (cow urine) can help to maintain optimum crop yield by maintaining the fertility status of the soil (Dotaniya et al., 2022). Cow urine contains 95% water, 2.5% urea, and 2.5% minerals, salts, hormones, and enzymes. It also contains essential minerals like iron, calcium, phosphorus, carbonic acid, potash, nitrogen, ammonia, manganese, sulphur, phosphates and potassium, urea, uric acid, amino acids, enzymes, cytokinin, lactose etc [1]. Research shows that only 20% of nitrogenous materials consumed by cattle are absorbed, and 80% are excreted in urine and dung. The beneficial effect of cow urine application has been reported on several crops, such as mustard [2, 3, 4], maize [5], sweet corn [6], and on vegetables/fruit, such as watermelon [7] and lablab bean [8]. Considering these facts, the present study was carried out with the objective of finding out the effect of irrigation schedules and cow urine spray on the density and dry biomass of Vicia sativa and the growth attributes of wheat.

**2. Materials and Methods**

A study was conducted at the Agricultural Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, during the rabi of 2019-20 and 2020-21 on the wheat variety HD2967. The experiment was laid out in a split-plot design with three main plots and seven subplots, and that was replicated thrice. The main plot factors were I1-Irrigation Water (IW)/Cumulative Pan Evaporation (CPE) 0.7, I2-IW/CPE 1.0, and I3-IW/CPE 1.2. The subplots were C1: Control, C2: spray of cow urine at CRI, C3: spray of cow urine at CRI + tillering, C4: spray of cow urine at CRI + tillering + late jointing, C5: spray at CRI + tillering + late jointing + flowering, C6: spray of cow urine at CRI + tillering + late jointing + flowering + milking, and C7: spray at CRI + tillering + late jointing + flowering + milking + maturity. Each treatment received a total quantity of 4000 liters of cow urine per ha. For example, C3 had cow urine spray at the CRI stage and tillering stage. So cow urine is applied in C3 treatment as follows: at the CRI stage, 2000 liters per ha, and at the tillering stage, 2000 liters per ha. The observations were recorded on the various aspects pertaining to density and dry biomass of Vicia sativa. The data were analyzed using analysis of variance (ANOVA), and the means were interpreted by the least significant difference (LSD) test at the 5% level.

**3. Results and Discussion**

**3.1 Effect on density of *Vicia Sativa***

The result revealed that the density of *Vicia sativa* was not significantly influenced by irrigation schedules and cow urine spray at different intervals during the both year of the experiment. In case of irrigation schedules, the lowest density of *Vicia sativa* was noted under I3 at 30 days after sowing during both the study period (Fig. 1).

**Fig.1: Weed density of *Vicia sativa* as influenced by irrigation schedules (I) and cow urine (CU) at 30 DAS**

Hence, the lowest density of Vicia sativa was noted under I3 in the first year and I1 at 60 and 90 days after sowing during both the study period (Figs. 2 and 3). The maximum density of Vicia sativa was recorded under I2 at 30 and 60 days after sowing during both years of the experiment (Figs. 1 and 2). The data shown in Figure 3, at 90 days after sowing, show the highest density of Vicia sativa was found under I2 in the first year and I3 in the second year of the experiment (Fig. 3). In the case of cow urine, the lowest density of Vicia sativa was found under C2 at 30 days after sowing during both years of the experiment (Fig. 1).

**Fig.2: Weed density of *Vicia sativa* as influenced by irrigation schedules (I) and cow urine (CU) at 60 DAS**

While at 60 days after sowing, the lowest density of *Vicia sativa* was noted under the C3 in the first year and C4 in the second year (Fig. 2). The data presented in Figure 3, at 90 days after sowing of the experiment, showed that the minimum density of *Vicia sativa* was observed under C4 in the first year and C3 in the second year of the study period. While at 30 days after sowing, the result revealed that the highest weed density of *Vicia sativa* was noted under C4 in the first year and C7 in the second year of the experiment (Fig. 1). The data shown in Figure 2, the maximum weed density of *Vicia sativa*, was found under the C5 at 60 days after sowing during the first year and C1 during the second year of the experiment. However, the greatest weed density of *Vicia sativa* was recorded under C1 in the first year and C7 in the second year of the experiment at 90 days after sowing (Fig. 3).

**Fig.3: Weed density of *Vicia sativa* as influenced by irrigation schedules (I) and cow urine (CU) at 60 DAS**

**3.2 Effect on dry biomass of *Vicia Sativa*:**

The result revealed that the dry biomass of Vicia sativa was not significantly influenced by irrigation schedules and cow urine sprays at different intervals during both years of the experiment. In case of irrigation schedules, the minimum dry biomass was noted under I3 in the first year and I1 in the second year at 30, 60, and 90 days after sowing (Table 1). While the maximum dry biomass was noted under I2 at 30 and 60 days after sowing during both the year of study period (Table 1). At 90 days after sowing, maximum density of Vicia sativa was found under I2 in the first year and I3 in the second year of the experiment. The data presented in Table 1 show that, in the case of cow urine, the lowest dry biomass of Vicia sativa was found under C2 at 30 days after sowing during both years of the experiment. However at 60 days after sowing, the minimum dry biomass of Vicia sativa was noted under the C3 in the first year and C5 in the second year (Table 1). Hence, the data shown in Table 1, at 90 days after sowing of the experiment, the minimum dry biomass of Vicia sativa was observed under C4 during both years of the experiment. Therefore, the result revealed that the highest dry biomass of Vicia sativa was noted under C1 at 30 days after sowing during both years of the experiment. At 60 days after sowing, the maximum dry biomass of Vicia sativa was found under the C1 during the first year and C2 during the second year of the experiment. However, the greatest dry biomass of Vicia sativa was recorded under C2 in the first year and C3 in the second year of the experiment at 90 days after sowing (Table 1).

**Table I: Dry biomass of *Vicia sativa* as influenced by irrigation schedules and cow urine at different intervals**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Treatment** | **Dry biomass of *Vicia sativa*(g m-2)** | | | | | |
| **30 DAS** | | **60 DAS** | | **90 DAS** | |
| **2019-20** | **2020-21** | **2019-20** | **2020-21** | **2019-20** | **2020-21** |
| **Irrigation Schedules (I)** | | | | | | |
| I1 | 9.97 | 13.19 | 16.69 | 15.15 | 8.78 | 5.93 |
| I2 | 10.12 | 15.56 | 16.75 | 17.44 | 8.81 | 6.64 |
| I3 | 9.84 | 15.49 | 16.22 | 17.37 | 8.53 | 6.85 |
| SEm ± | 0.21 | 0.52 | 0.48 | 0.50 | 0.25 | 0.15 |
| LSD (*p*=0.05) | NS | NS | NS | NS | NS | NS |
| **Cow urine (CU)** | | | | | | |
| C1 | 9.68 | 14.61 | 15.92 | 16.24 | 8.41 | 8.31 |
| C2 | 9.11 | 13.20 | 15.13 | 16.50 | 8.44 | 8.28 |
| C3 | 9.40 | 13.94 | 14.68 | 15.94 | 8.17 | 8.34 |
| C4 | 9.41 | 13.54 | 15.11 | 15.41 | 7.53 | 7.63 |
| C5 | 9.19 | 13.24 | 15.53 | 15.12 | 8.06 | 7.67 |
| C6 | 9.49 | 14.20 | 14.81 | 16.04 | 7.69 | 7.95 |
| C7 | 9.54 | 14.50 | 14.71 | 16.34 | 7.63 | 7.78 |
| SEm ± | 0.22 | 0.57 | 0.52 | 0.55 | 0.37 | 0.27 |
| LSD (*p*=0.05) | NS | NS | NS | NS | NS | NS |
| Interaction (I x C) | NS | NS | NS | NS | NS | NS |

**4. Conclusion:** The result revealed that the density and dry biomass of *Vicia sativa* were not significantly influenced by irrigation schedules and cow urine spray at different intervals during the both year of the experiment

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**Table 2: Weed density of *Vicia sativa* as influenced by irrigation schedules and cow urine at different intervals**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Treatment** | **Density of *Vicia sativa* (No. m-2)** | | | | | |
| **30 DAS** | | **60 DAS** | | **90 DAS** | |
| **2019-20** | **2020-21** | **2019-20** | **2020-21** | **2019-20** | **2020-21** |
| **Irrigation Schedules (I)** | | | | | | |
| I1: IW/CPE 0.7 | 5.27 | 5.97 | 3.67 | 3.00 | 1.44 | 0.91 |
| I2: IW/CPE 1.0 | 5.36 | 7.04 | 3.69 | 3.45 | 1.44 | 1.02 |
| I3: IW/CPE 1.2 | 5.21 | 7.01 | 3.57 | 3.44 | 1.40 | 1.05 |
| SEm ± | 0.11 | 0.23 | 0.11 | 0.10 | 0.04 | 0.02 |
| LSD (*p*=0.05) | NS | NS | NS | NS | NS | NS |
| **Cow urine (C)** | | | | | | |
| C1: Control | 5.10 | 6.33 | 3.27 | 3.69 | 1.54 | 1.61 |
| C2: Cow urine @ 4000 L at CRI | 4.82 | 5.97 | 3.36 | 3.26 | 1.42 | 1.43 |
| C3: Cow urine @ 4000 L at CRI + Tillering | 4.98 | 6.31 | 3.23 | 3.46 | 1.34 | 1.36 |
| C4: Cow urine @ 4000 L CRI + Tillering + Late jointing | 5.12 | 6.13 | 3.33 | 3.05 | 1.23 | 1.71 |
| C5: Cow urine @ 4000 L CRI + Tillering + Late jointing + Flowering | 4.86 | 5.99 | 3.42 | 3.40 | 1.32 | 1.72 |
| C6: Cow urine @ 4000 L CRI + Tillering + Late jointing + Flowering + Milking | 5.02 | 6.42 | 3.26 | 3.17 | 1.26 | 1.76 |
| C7: Cow urine @ 4000 L CRI + Tillering + Late jointing + Flowering + Milking + Maturity | 5.05 | 6.56 | 3.24 | 3.23 | 1.35 | 1.77 |
| SEm ± | 0.12 | 0.26 | 0.11 | 0.21 | 0.14 | 0.13 |
| LSD (*p*=0.05) | NS | NS | NS | NS | NS | NS |
| **Interaction (I x C)** | NS | NS | NS | NS | NS | NS |

**Table 3: Dry biomass of *Vicia sativa* as influenced by irrigation schedules and cow urine at different intervals**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Treatment** | **Dry biomass of *Vicia sativa* (g m-2)** | | | | | |
| **30 DAS** | | **60 DAS** | | **90 DAS** | |
| **2019-20** | **2020-21** | **2019-20** | **2020-21** | **2019-20** | **2020-21** |
| **Irrigation Schedules (I)** | | | | |  | |
| I1 | 9.97 | 13.19 | 16.69 | 15.15 | 8.78 | 5.93 |
| I2 | 10.12 | 15.56 | 16.75 | 17.44 | 8.81 | 6.64 |
| I3 | 9.84 | 15.49 | 16.22 | 17.37 | 8.53 | 6.85 |
| **Cow urine (CU)** | | | | |  | |
| C1 | 9.68 | 14.61 | 15.92 | 16.24 | 8.41 | 8.31 |
| C2 | 9.11 | 13.20 | 15.13 | 16.50 | 8.44 | 8.28 |
| C3 | 9.40 | 13.94 | 14.68 | 15.94 | 8.17 | 8.34 |
| C4 | 9.41 | 13.54 | 15.11 | 15.41 | 7.53 | 7.63 |
| C | 9.19 | 13.24 | 15.53 | 15.12 | 8.06 | 7.67 |
| C6 | 9.49 | 14.20 | 14.81 | 16.04 | 7.69 | 7.95 |
| C7 | 9.54 | 14.50 | 14.71 | 16.34 | 7.63 | 7.78 |