2.4 Observations and measurements

Five representative plants were randomly selected from the central two rows of each plot and tagged after transplanting for recording growth observations. Plant height (measured from the soil surface to the tip of the longest leaf), leaf length (base to tip of the longest fully expanded leaf), and the number of leaves per plant were recorded at 30, 60, 90, and 120 days after transplanting (DAT).

At harvest, stem diameter (measured 2 cm above the bulb neck), bulb fresh weight, bulb length, equatorial bulb diameter, and root length were measured using a digital Vernier caliper (±0.01 mm) and a digital balance (±0.1 g). Total bulb yield was determined from the fresh weight of all harvested bulbs in each plot and converted to tonnes per hectare (t/ha).

2.5 Statistical analysis

The recorded data were subjected to analysis of variance (ANOVA) appropriate for a Randomized Complete Block Design (RCBD) using RStudio version 4.3.1. Before conducting ANOVA, the assumptions of normality and homogeneity of variance were verified using the Shapiro-Wilk and Levene's tests, respectively. Treatment means were compared using Duncan's Multiple Range Test (DMRT) at the 5% level of significance. The coefficient of variation (CV%) was calculated to assess the precision of the experiment.

3 Results and Analysis

3.1 Plant height

Plant height increased progressively across all treatments from 30 to 90 DAT, with a characteristic decline at 120 DAT reflecting assimilate remobilization from foliar tissues to the developing bulb during senescence (Brewster, 2008). No significant treatment differences were detected at 30 DAT (Table 1). Significant effects were evident from 60 DAT onward.

Table 1 Effect of mulching treatments on plant height (cm) of onion (*Allium cepa* L.) at 30, 60, 90, and 120 days after transplanting (DAT)

Treatments	Plant height (cm)			
	30 DAT	60 DAT	90 DAT	120 DAT
Control	18.47b	35.62c	52.83d	48.91c
Banana leaf mulch	19.53ab	38.74bc	58.16c	53.45bc
Sawdust mulch	20.28ab	41.15b	61.42bc	58.07b
Rice straw mulch	21.74a	44.58a	67.93a	63.41a
Plastic mulch	21.19a	44.07a	65.28ab	61.83a
LSD ($p \leq 0.05$)	2.94	3.51**	4.23**	4.01***
CV (%)	7.86	4.42	3.81	3.64
Grand mean	20.24	40.83	61.12	57.13

Note: Means in a column followed by different lowercase letters differ significantly at $p \leq 0.05$ (DMRT). ** $p \leq 0.01$; *** $p \leq 0.001$. DAT: days after transplanting; LSD: least significant difference; CV: coefficient of variation

Rice straw mulch recorded the tallest plants at 60 DAT (44.58 cm), 90 DAT (67.93 cm), and 120 DAT (63.41 cm), closely followed by plastic mulch (44.07, 65.28, and 61.83 cm, respectively). The control consistently produced the shortest plants across all stages. The superiority of rice straw mulch for plant height is attributable to its dual role in moisture retention and progressive release of nitrogen and other nutrients as decomposition proceeds, augmenting the inorganic fertilizer program (Baten et al., 1995; Ramakrishna et al., 2006). These findings are consistent with Islam et al. (2007) and Mutetwa and Mtaita (2014), who documented superior plant height responses under straw mulch compared with bare soil in *Allium* crops.

3.2 Number of leaves per plant

Leaf count per plant was significantly influenced by mulching at all observation stages (Table 2). Plastic mulch consistently recorded the greatest leaf numbers: 4.73 (30 DAT), 7.00 (60 DAT), 9.27 (90 DAT), and 9.00 (120 DAT). The control produced the fewest leaves at every stage. Plastic mulch maintains stable, slightly elevated soil