

Background

The peanut Basin of Senegal is a semi arid area where rainfall is erratic and poorly distributed. Mean annual rainfall is 450 and 700 mm in the North and Centre South, respectively, and in each area one native shrub is thriving. Annual food crops are grown in association with two widely occurring shrub species; *Guiera senegalensis* and *Piliostigma reticulatum*. These shrubs harbor nutrients and may increase plant available water which can help increase crop yield.

Objectives

To determine the effect of shrubs and fertilizer rate on millet growth, development and yield during rainfed conditions.

Material & Methods

Experiments were conducted 2 sites (Fig. 1) : the first site, Keur Matar Arame (KMA), is located in Thiès (14° 46'N, 16° 51'W), with a mean annual temperature of 30° C the rainfall was 467.5 mm (2013) and it has a sandy soil, classified as leached ferric lixisol. *G. senegalensis* is widely spread. The second site is located at Nioro (13° 45'N, 15° 47'W), predominantly occupied by *P. reticulatum* shrubs on a sandy, lateritic area classified as Haplic Ferric Lixisol.

Millet (var-SounaIII) was sown at KMA and Nioro on June 28 and July 22, 2013 respectively. Crop grown in split plot design (3 replications) with Shrub as main factor (presence of shrub: +S and absence of shrub: -S) and Fertilizer as subplot (with fertilizer: +F and no fertilizer: -F) Treatments were: No shrub and no fertilizer (-S-F); Shrub+ Fertilizer (+S+F); Shrub no Fertilizer (+S-F); no shrub with Fertilizer (-S+F). Fertilizer rates applied were 0 and 150 kg ha⁻¹ (recommended rate).

Measurements and observations were carried out every week:

- The number of millet leaves on main tiller were counted on 5 central plants per plot and their height (cm) was measured at the same time.
- The percentage of plants in the panicle stage were determined by number of plants at this stage divided by total number of plants per plot.
- Yield components (grain, straw) were evaluated per plot. At KMA there was no grain due to lack of rain and an insect attack in the grain-filling phase but panicle mass was considered. Harvested area square was 28.8 m² in Nioro and 27 m² in Keur Matar.
- ANOVA and LSD (0.05) test were used to determine treatments effects.

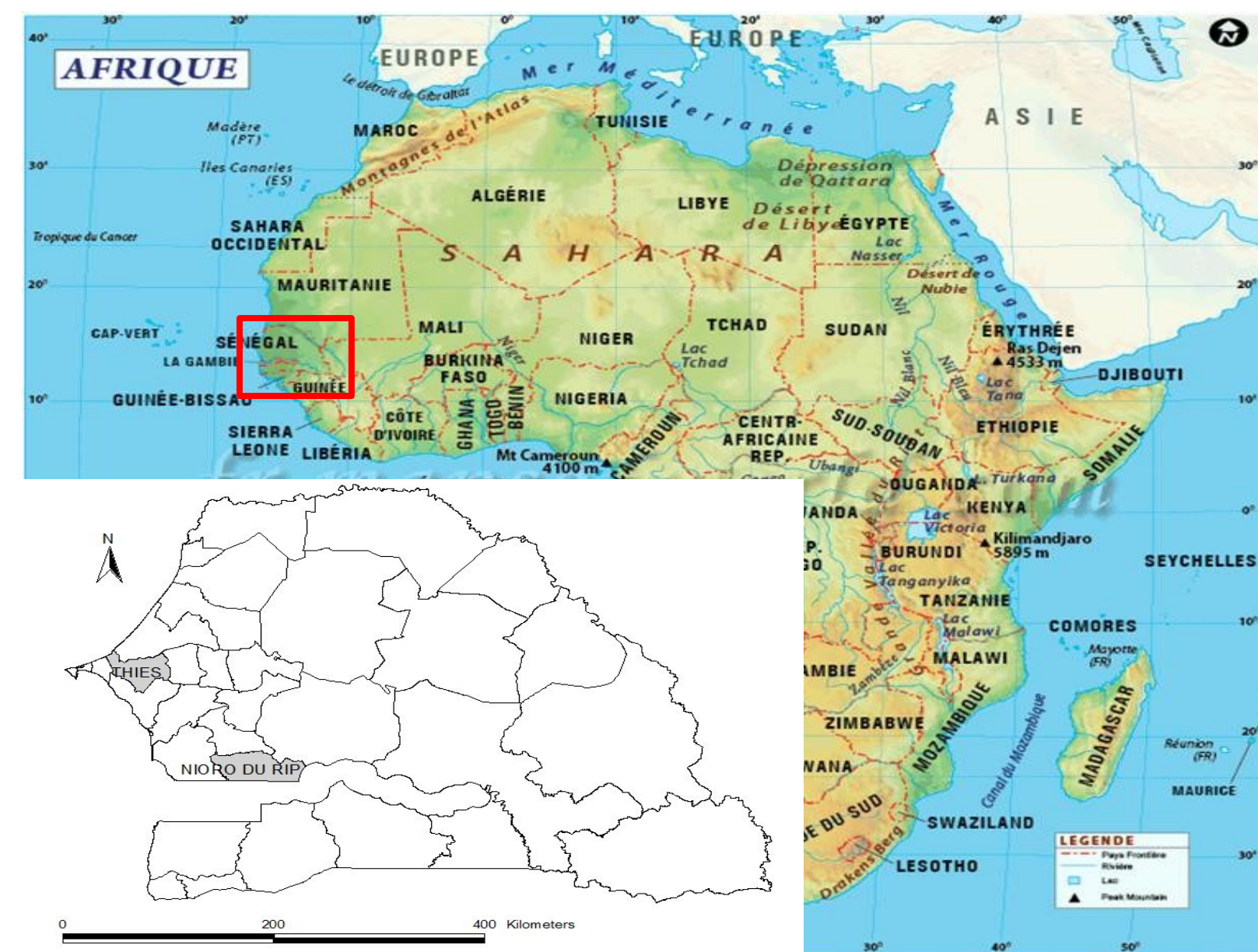


Fig. 1 experimental sites located in Senegal

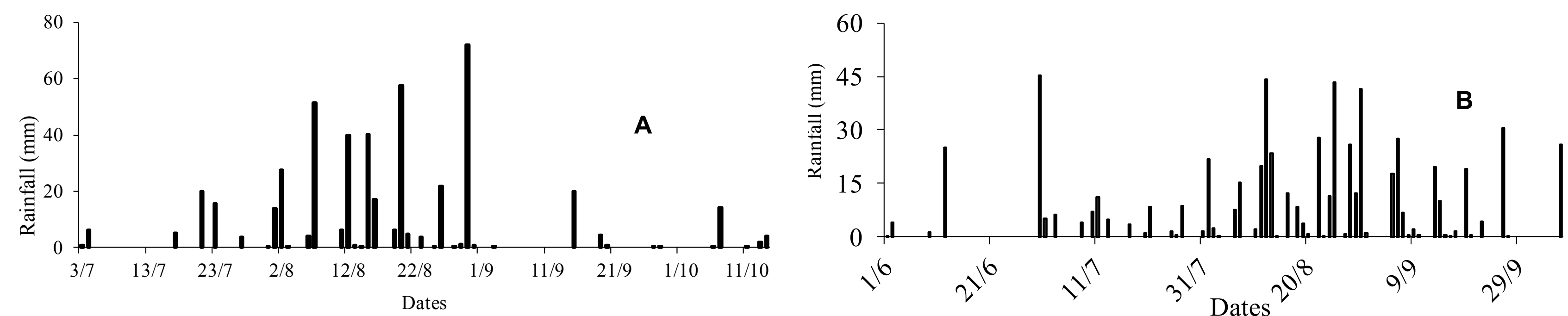


Fig. 2 Rainfall distribution in (A): Keur Matar, total rainfall : 467.5 mm; (B): Nioro, total rainfall: 634.3 mm



Guiera senegalensis



Piliostigma reticulatum

Results and discussion

Influence of *Guiera senegalensis* on:

Number of leaves

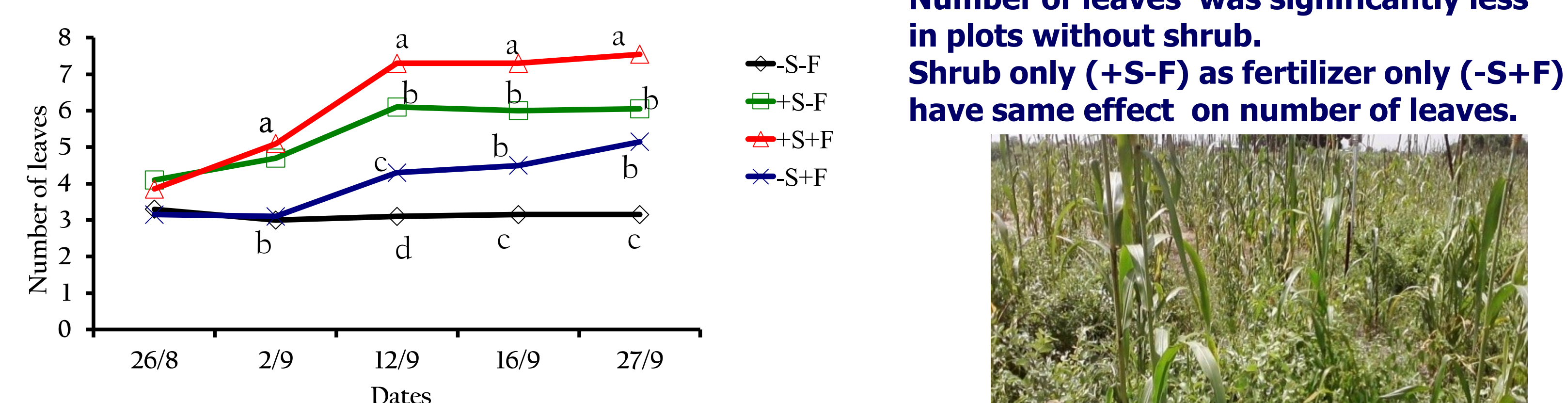


Fig. 3 Number of leaves per plant

Number of leaves was significantly less in plots without shrub. Shrub only (+S-F) as fertilizer only (-S+F) have same effect on number of leaves.



Percentage of plants starting panicles initiation phase

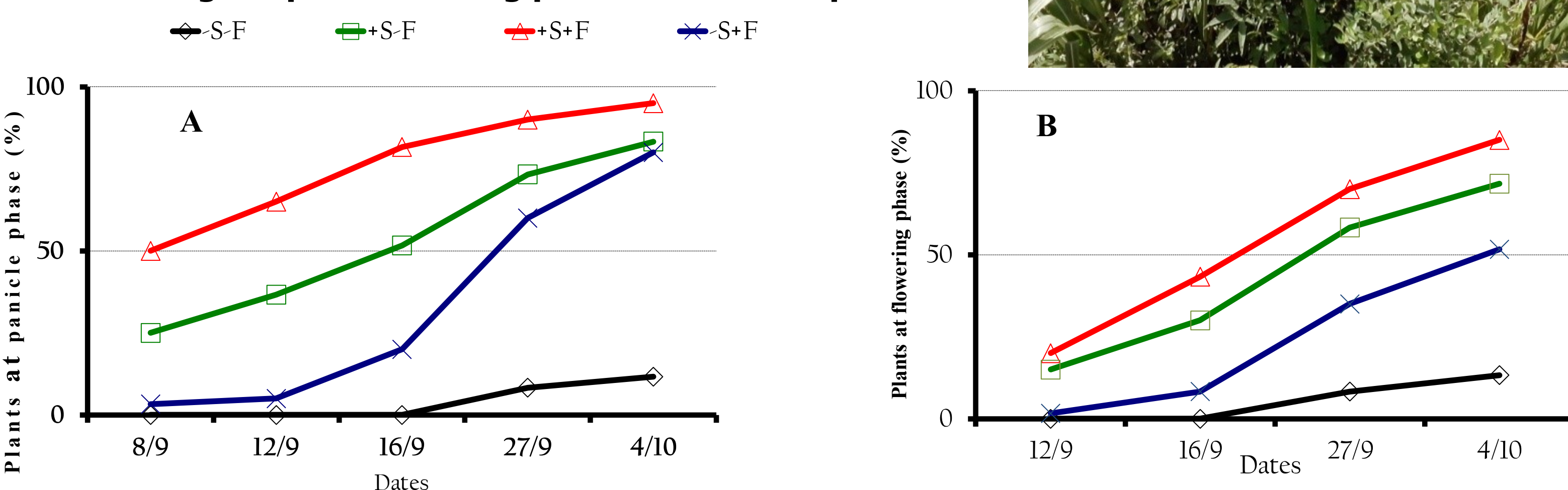


Fig. 4 Millet at panicle phase (A) and flowering phase (B) in different treatments

Panicle and flowering phases started earlier in treatments with shrub than control and plot with fertilizer only.

Millet plants growth

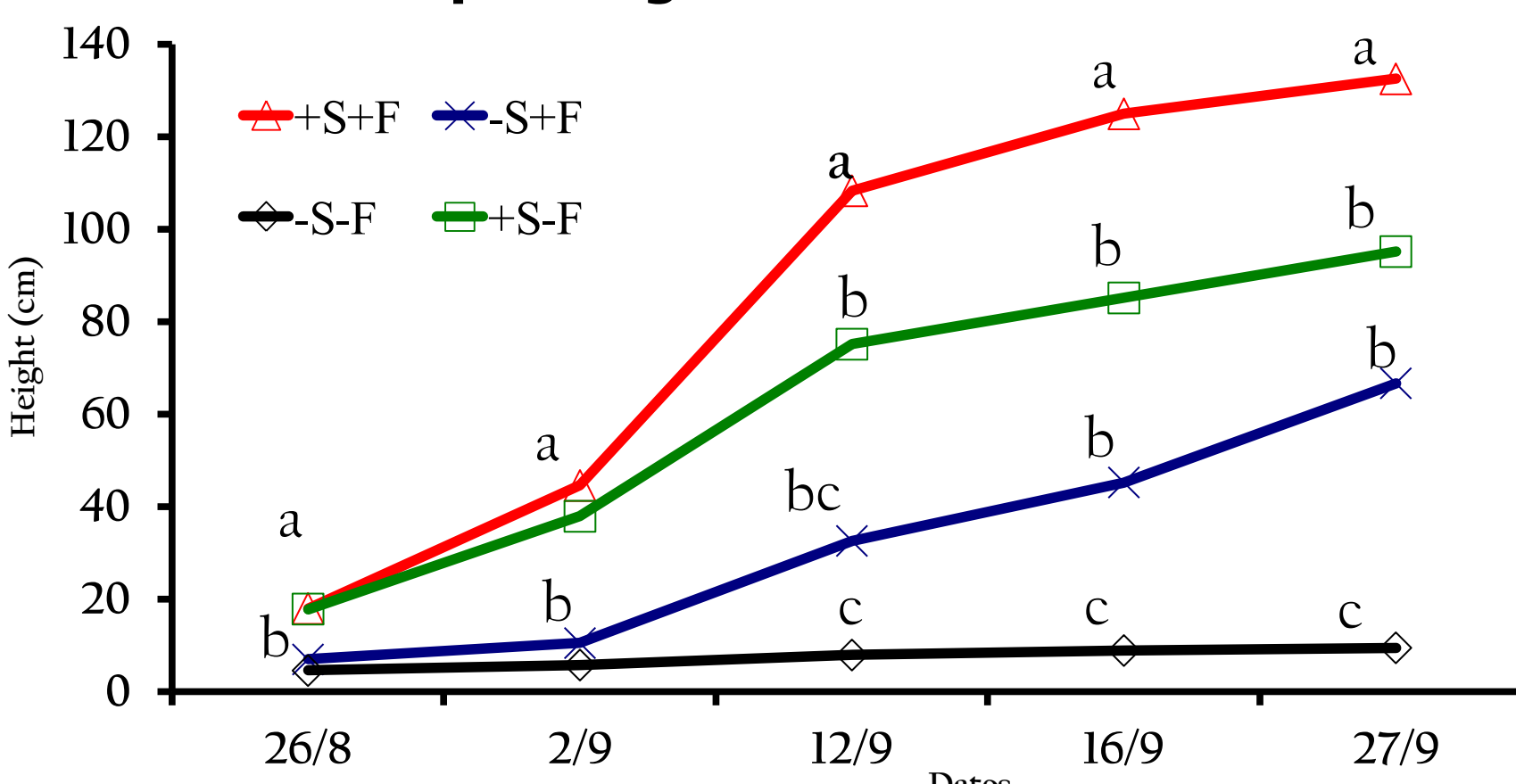


Fig. 5 Comparison of treatments on millet growth



Shrub combined with fertilizer showed substantially taller millet height. Response of millet height was statistically the same on fertilizer only and Shrub only plots. Control (-S-F) showed the least millet development

Biomass

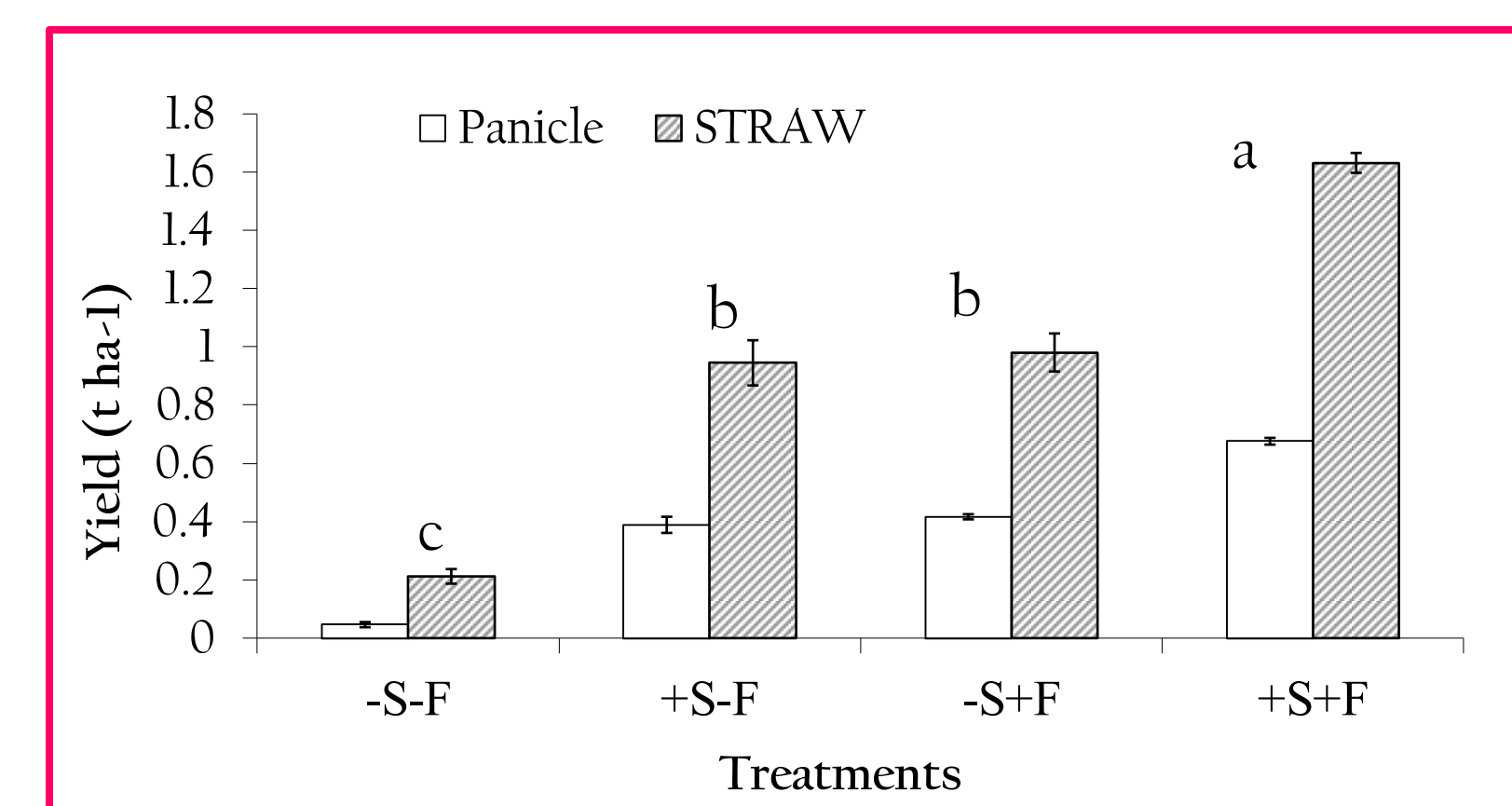


Fig. 6 Comparison of treatments on millet yield

Panicle weight was considered as yield because no grain was produced by millet, it is due to water deficit observed in the end of cropping season as well as an attack by insects (Fig. 1). Straw and panicle yields were statistically different in plots with shrub and fertilizer than control (-S-F). Shrub associated with fertilizer (+S+F) led to an increase in straw and panicle weight. No shrub plots combined with fertilizer (-S+F) had the same effect as shrub plots and no fertilizer (+S-F) on straw and panicle yield.

Influence of *Piliostigma reticulatum* on millet:

Number of leaves

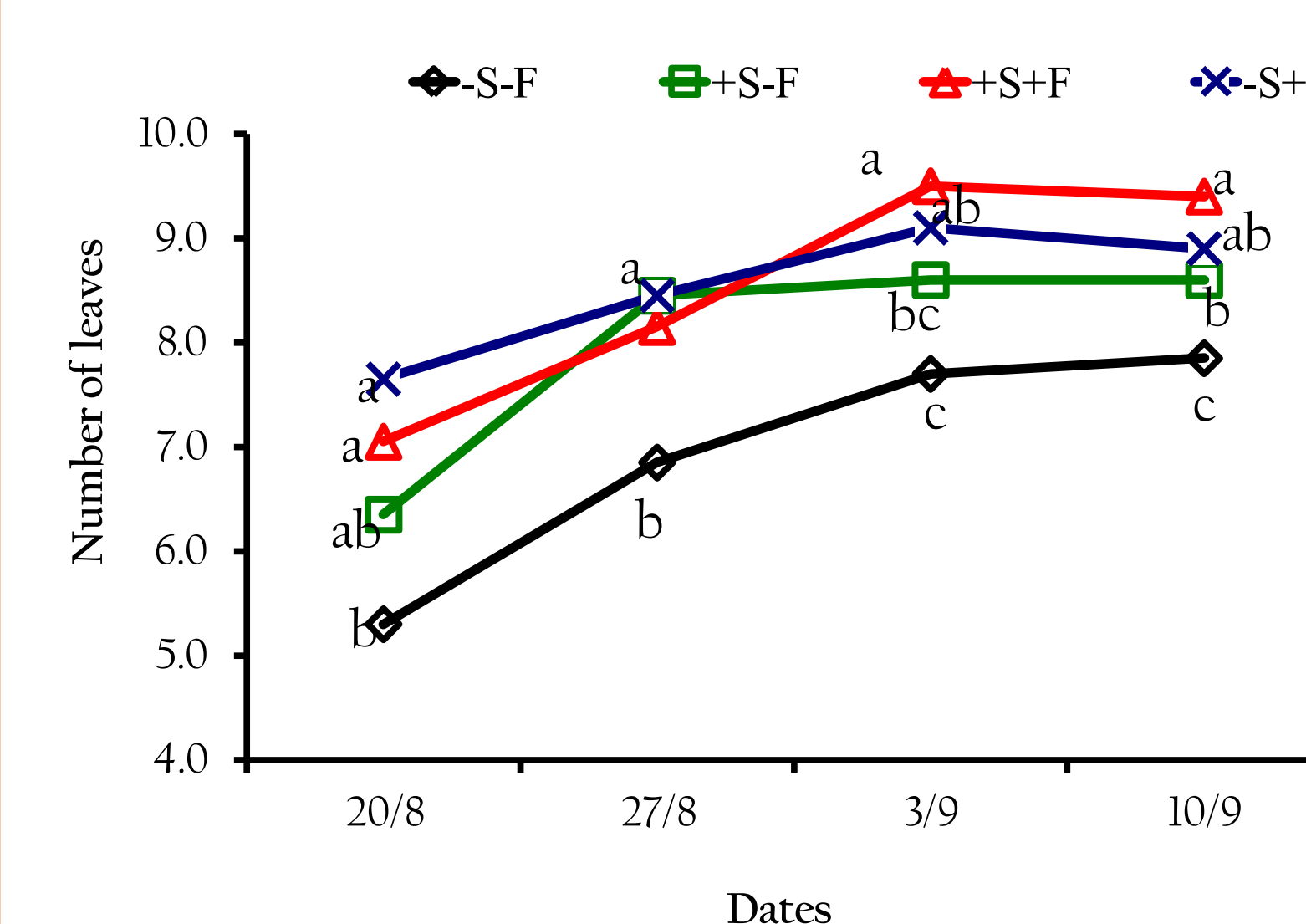


Fig. 7 Number of leaves variation

Shrub or fertilizer increased significantly number of millet leaves than control (-S-F).

Millet yield

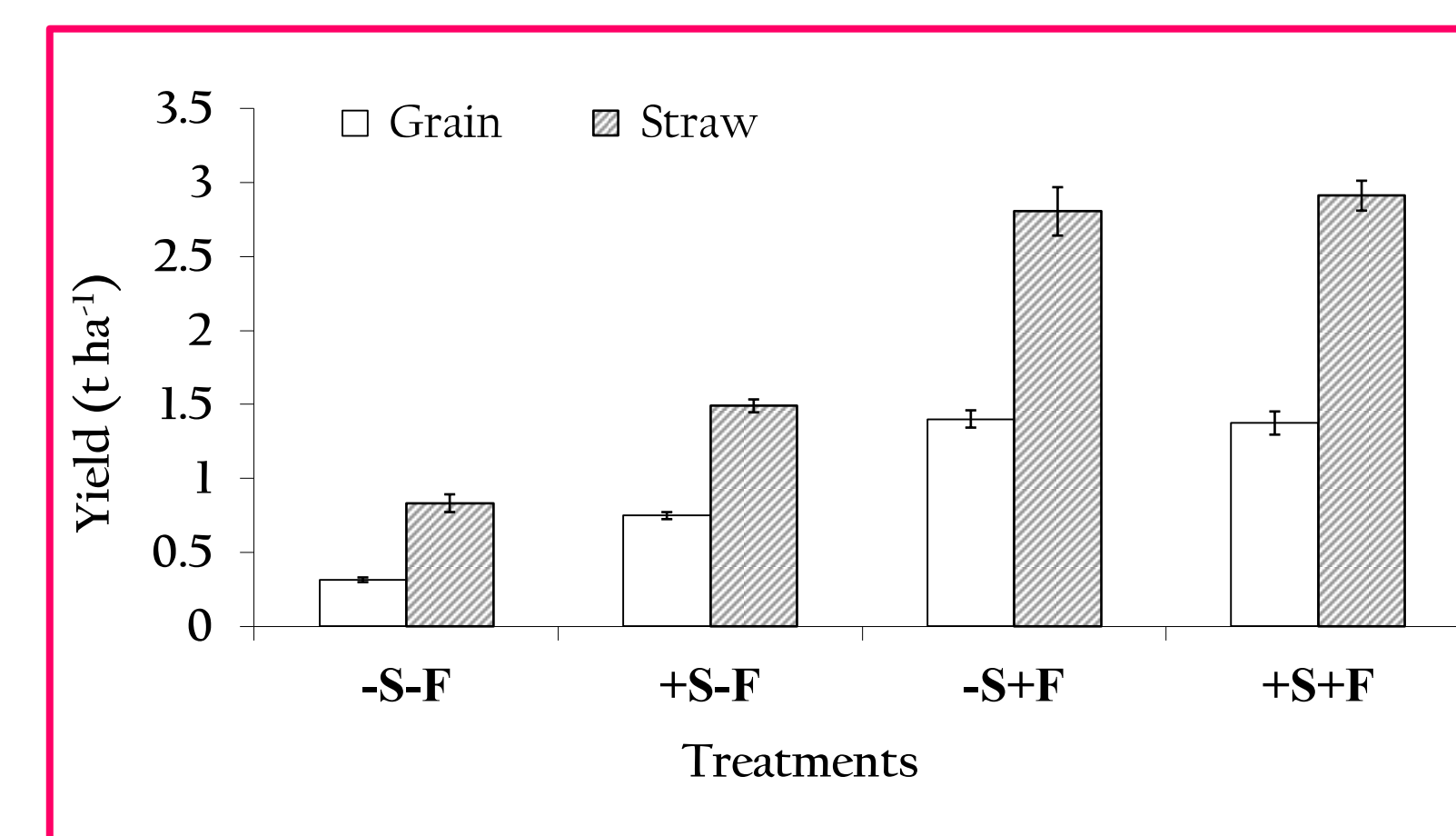


Fig. 9 Comparison of treatments on millet yield

Millet plants growth

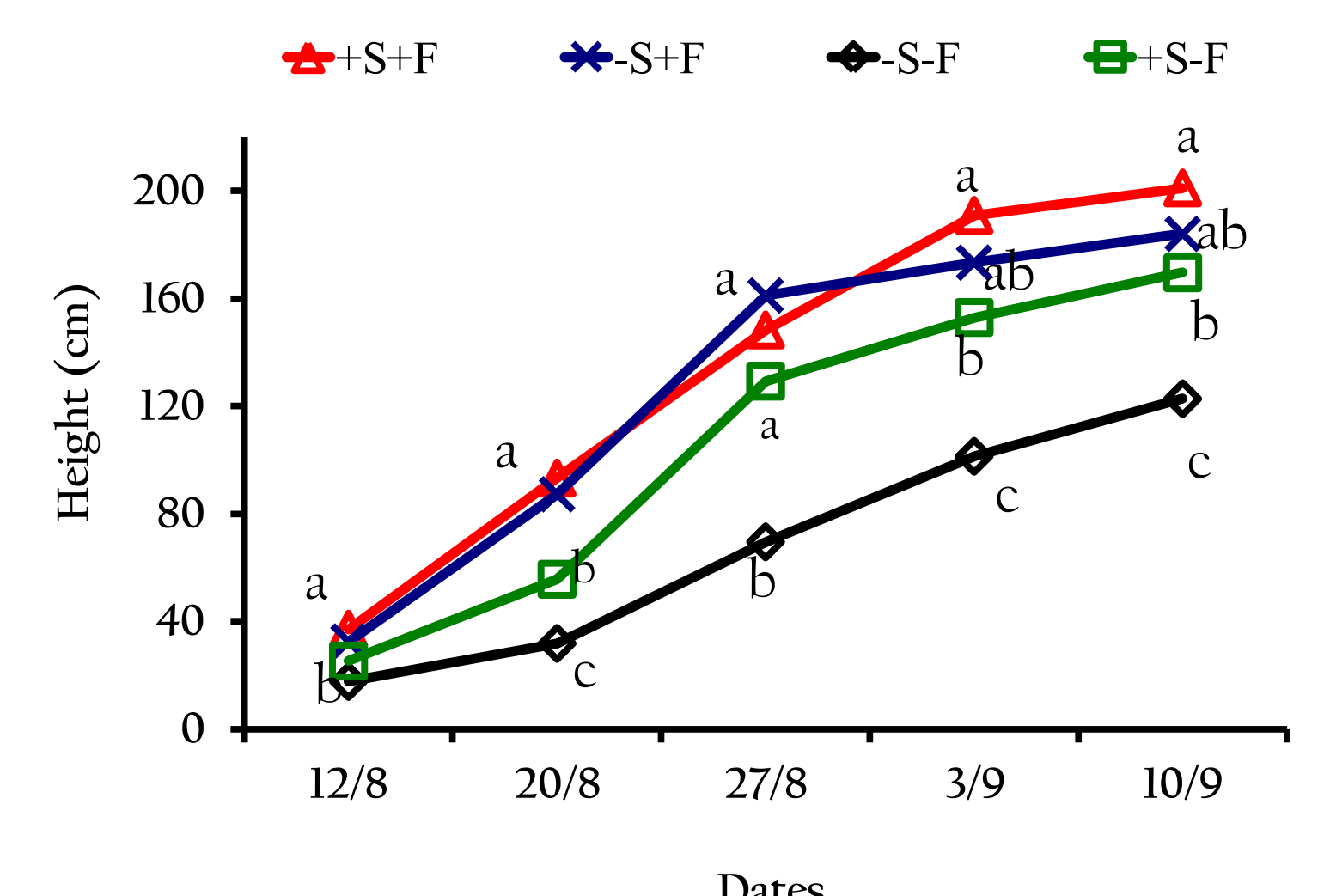


Fig. 8 Comparison of treatments on millet growth
Millet height was significantly larger in plot with shrub and fertilizer than the no shrub no fertilizer plot.

Yields were higher in presence of shrub and fertilizer plot (Fig. 6). Shrub and fertilizer combination was not different to fertilizer only on yields. Grain and straw yields were significantly higher in shrub plot than control.

Conclusions

- Crop growth near shrub suggests that environmental conditions were favorable for increased growth in the early season.
- Presence of shrub on field could improve nutrient acquisition for crop because the effect of shrub only on yields was the same with fertilizer plot.
- At Nioro water is not a constraint to millet growth and yield; rainfall is always sufficient. Applied fertilizer induced highly significant differences between treatments at both sites.
- Need to continue investigation of similar parameters on peanut growth and yield in years where peanut is sown in the fields.
- Shrub could contribute to reduce water deficit in area where rainfall is under critical level

Acknowledgements

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