Effect of foxtail millet cultivars on yield and yield attributes under different sowing windows

Abstract

The investigation conducted at the Agronomy Farm, College of Agriculture, Pune, during the *Kharif* season of 2022 focused on the "Effect of foxtail millet cultivars on yield and yield attributes under different sowing windows." The study employed a split-plot design with sixteen treatments and three replications, involving four sowing dates (26 MW, 28 MW, 30 MW, and 32 MW) and four foxtail millet varieties (SiA 3156, SiA 3085, Suryanandi, and Renadu). The soil, a clay loam with slightly alkaline pH, low nitrogen, medium phosphorus, and high potassium levels, received RDF 60:30:30 N:P_2O_5:K_2O kg ha^{-1} at sowing. The investigation monitored various growth parameters, including plant height, number of tillers, number of functional leaves, and dry matter accumulation, at different growth stages. The study revealed that early sowing at 26 MW significantly influenced plant height, number of tillers, and dry matter production, favoring greater vegetative growth. The Renadu variety consistently exhibited superior performance in plant height, tiller count, and dry matter accumulation compared to other varieties. Days to 50% flowering and maturity were significantly affected by both sowing dates and varieties, with early-sown crops taking more days to reach these stages. Grain yield, straw yield, and harvest index were influenced by sowing dates and varieties, with the combination of the Renadu variety and 26 MW sowing exhibiting the highest grain yield and straw yield. Renadu also displayed a superior harvest index, emphasizing its suitability for optimal growth and yield. The study recommends sowing foxtail millet on 26 MW or 28 MW, particularly with the Renadu variety, for achieving maximum growth and yield during the Kharif season. The findings highlight the significance of considering both sowing windows and foxtail millet varieties to optimize production in the given agro-climatic conditions of Pune, Maharashtra.

1. Introduction

Millets, a type of small crop, have gained recognition as nutraceuticals due to their rich supply of dietary fibers, minerals, vitamins, proteins, antioxidants, and energy. Commonly grown in India are Jowar (Sorghum), Bajra (Pearl millet), Ragi (Finger millet), Jhangora (Barnyard millet), Barri (Proso or common millet), Kangni (Foxtail/Italian millet), and Kodra (Kodo millet). These small millets are unique crops traditionally cultivated in

India's drylands and serve dual purposes. They play a significant role in supporting and sustaining communities in arid and semi-arid regions, where low seasonal rainfall, increased temperatures, and extreme weather events are prevalent (Ravindranadh *et al*., 2019).In recent years, there has been a growing awareness of the importance of millets as a substitute for major cereal crops. Millets possess the potential to enhance food production in both developing and developed countries (Verma *et al*., 1983).Foxtail millet, also known as Italian millet, German millet, korralu, Kangu, Kangani, Koni, and Kaon in different parts of India, is one of the oldest and second most cultivated small millets for food grain and fodder. It continues to play a crucial role in agriculture worldwide, providing sustenance for millions of people in arid and semi-arid regions due to its drought tolerance (Sahoo *et al*., 2020). Foxtail is a climate-resilient, short-duration, and cost-effective crop that offers superior nutrition by providing protein and minerals at an affordable price. Moreover, its quick growth makes it suitable as a short-term catch crop (Srikanya *et al*., 2020). In some regions, sprouted foxtail millet grains are consumed as vegetables (Sarita and Singh, 2016). The cultivation of millets dates back to around 8000 years ago in the highlands of central China (Amgai *et al*., 2014). The countries which grow foxtail millets include China, India, Afghanistan, Central Asia, Manchuria, Korea and Georgia. Foxtail millet is among specialty crops of Japan (Joshi *et al*., 2021). Although foxtail millet is native to China, India has emerged as the world's leading producer of millets, with a production of 10.9 million tons in 2019. Foxtail millet is cultivated on approximately 98,000 hectares of land in India, producing around 56,000 tonnes of grain with an average productivity of 565 kg per hectare in Andhra Pradesh, Karnataka, Telangana, Rajasthan, Maharashtra, Tamil Nadu and north eastern states. The increasing consumption of foxtail millet, particularly among individuals with diabetes, has led to a rising demand for this crop (Hariprasanna, 2006). Unlike rice, foxtail millet releases glucose steadily without affecting the body's metabolism, making it a suitable option for individuals with diabetes (Srikanya *et al*., 2020). Foxtail millet offers good nutritional value, with 100 g of grains containing 9.9 g protein, 72 g carbohydrates, 2.5 g fat, 3.5 g ash, 10 g crude fiber, 0.27 mg potassium, 0.01 mg thiamine, 0.099 mg riboflavin, 0.82 mg pantothenic acid, 3.70 mg niacin, and 0.02 mg folacin, providing 351 kilocalories of energy (Sarita and Singh, 2016). It also has a low glycemic index, making it suitable for the preparation of low GI foods that can benefit individuals with type 2 diabetes and cardiovascular diseases. Foxtail millet contains a significant amount of protein, fat, and antioxidants such as phenols, phenolic acids, and carotenoids (Saleh *et al*., 2013; Zhang and Liu, 2015). The fiber content, specifically β-glucans (42.6%), promotes the metabolism of sugar and cholesterol, leading to lower levels of both, which is beneficial for diabetes and cardiovascular disease prevention. Foxtail millet is also a rich source of B vitamins such as thiamin (B1), riboflavin (B2), niacin (B3), and folate (B9), which are essential for the nervous system and brain function. To maximize the collective health benefits of nutrients, millets are often consumed as multi-grains (Sarita and Singh, 2016). The low yield potential of small millets, including foxtail millet, can be attributed to the cultivation of low-yielding varieties and inadequate management practices. To achieve maximum yield potential, it is important to cultivate high-yielding varieties that are tolerant to drought and responsive to fertilizer application (Anonymous, 2017). Efforts are being made to introduce new short-duration varieties like SIA 3085 and SIA 3088, which have a yield potential of 20-25 q ha^{-1}. Increasing the area under foxtail millet cultivation is a viable option due to the availability of new opportunities and varieties.

Material and Methods

An investigation on the "Effect of foxtail millet cultivars on yield and yield attributes under different sowing windows" was carried out at Agronomy Farm, College of Agriculture, Pune (Maharashtra) during *Kharif* season of 2022.Soil was clay loam in texture, slightly alkaline in reaction (pH 7.94), low in available nitrogen (162.34 kg ha^{-1}), medium in available phosphorus (18.12 kg ha^{-1}) and high in available potassium (298.61 kg ha^{-1}). The experiment was laid out in split plot design with sixteen treatments and three replications. The treatments comprised of four sowing dates (S_1: 26 MW; S_2: 28 MW; S_3: 30 MW; S_4: 32 MW) and four varieties (V_1: SiA 3156; V_2: SiA 3085; V_3: Suryanandi; V_4: Renadu). The RDF 60:30:30 N: P_2O_5: K_2O kg ha^{-1} was applied through urea, single super phosphate and muriate of potashat the time of sowing.The foxtail millet crop was sown according to the following treatments: first on July 1, second on July 15, third on July 27, and fourth on August 8, 2022. In addition to grain and straw yield and yield attributes were also recorded. The previous chapters reported and discussed the outcomes. The important findings of the investigation were reported and discussed below.

Result and Discussions

Data in respect of initial and final plant count of foxtail millet as influenced by sowing windows and varieties is disclosed in Table 1. The mean values of initial and final count were 315141 and 311441 respectively. The initial and final count did not vary considerably as a result of different sowing windows, various foxtail millet varieties and interaction effect between sowing dates and varieties of foxtail millet. The growth attributing characters of foxtail millet were recorded periodically at an interval of 14 days from sowing date and are discussed below. The data referring to mean plant height as influenced by sowing windows and varieties of foxtail millet at 28, 42, 56, 70 DAS and harvest are displayed in

Table 1. The mean plant height at 28, 42, 56, 70 DAS and at harvest were 20.18, 54.94, 80.34, 124.09, 125.01 cm respectively. The plant height was influenced significantly due to sowing windows. The crop sown on 26 MW exhibited highest plant height at 28, 42, 56, 70 DAS and at harvest (29.47, 74.16, 95.13, 139.58, 140.42 cm) respectively which was followed by 28 MW. Significantly minimum plant height was recorded with 32 MW at all growth stages. Compared to late-sown crops, the early-sown crop may have an advantage of longer photoperiod for vegetative growth, which enabled plants to synthesize more photosynthetic and reach their maximum height. Similar findings were reported by Nandini *et al.* (2019) and Mubeena *et al.* (2019). The plant height was influenced significantly due to different varieties of foxtail millet. The variety Renadu recorded significantly maximum plant height at 28, 42, 56, 70 DAS and at harvest (21.30, 58.77, 84.23, 128.95, 129.70 cm) respectively. At all growth stages it was at par with variety SiA 3085. Whereas, the minimum height of plant was recorded in variety Suryanandi at 28, 42, 56, 70 DAS and at harvest. Plant height is genetically governed phenomenon, hormonal balance, nutrient absorption and conversion of radiant energy to chemical energy in presence of chlorophyll. All these physiological processes were reflected in increased height and other yield attributing characteristics. Similar findings were perceived with Srikanya *et al.* (2020). While, the interaction effects between sowing windows and varieties in respect of plant height were found to be non-significant. Number of tillers plant differed significantly due to sowing windows and varieties are presented in Table 1. The average values of number of tillers plant^{-1} at 28, 42, 56, 70 DAS and final harvest were 1.58, 1.80, 3.37, 2.73, 2.73 respectively. On perusal of data the number of tillers plant^{-1} were significantly influenced due to different sowing dates. The crop sown on 26 MW produced maximum number of tillers plant^{-1} at 56 DAS (3.79). However, it was slightly reduced at 70 DAS (3.13) and was constant at final harvest which was significantly superior over the rest of sowing dates. This was at par with 28 MW except at 42 DAS. Significantly minimum number of tillers plant^{-1} were recorded in 32 MW at 28, 42, 56, 70 DAS and at harvest. The reduction in number of tillers caused due to sowing dates might be because of difference in photoperiod and temperature. Sowing on 26 MW and 28 MW was favourable to high grain production because anthesis period and stigma receptivity coincided with relatively optimal temperature. However, the late sowing dates were unfavourable since it has adverse effect of temperature and photoperiod, ultimately which affects emergence and tillers of plants. In comparison to late sown crop, early sown crop favours good temperature and photoperiod which is directly correlated with tillering. Similar results were noted by Srikanya *et al.* (2020). Different varieties significantly influenced the number of tillers plant^{-1} at different stages. The variety Renadu recorded significantly maximum number of tillers plant^{-}

^{1}(2.95, 2.51, 4.58) at 28, 42, 56 DAS respectively which slightly reduced at 70 DAS (4.0) and recorded constant at harvest which was followed by SiA 3085. The minimum number of tillers plant^{-1} at different growth stages was recorded in variety Suryanandi. Variation in number of tillers plant^{-1} among varieties might be due to the presence of genetic diversity for this feature. Similar results were noted by Srikanya *et al.* (2020). The interaction effect between sowing windows and varieties with respect to number of tillers plant^{-1} of foxtail millet were found to be significant at all growth stages. The relevant data is presented in Table 1. The interaction of 26 MW with variety Renadu recorded significantly highest number of tillers at 28, 42, 56, 70 DAS and at harvest than rest of treatment combination. The data pertaining to number of functional leaves plant^{-1} influenced by sowing windows and varieties are presented in Table 1. The mean values of number of functional leaves plant^{-1} were 3.42, 5.01, 6.71, 10.16 and 7.11 at 28, 42, 56, 70 DAS and at harvest, respectively. Number of functional leaves plant^{-1} was significantly affected due to sowing windows. The sowing date of 26 MW recorded maximum number of functional leaves plant^{-1} (4.0, 5.90, 7.85, 11.89, 8.32) at 28, 42, 56, 70 DAS and at harvest respectively which was followed by crop sown on 28 MW. The crop sown on 32 MW recorded significantly minimum number of functional leaves plant^{-1}. This may be the result of a longer photoperiod and more radiation intercepted during *Kharif* season, which accelerated photosynthesis and accumulation of assimilates. This may have been used to induce leaf development in foxtail millet. With early sown crop, less incidence of biotic and abiotic stress was noticed, as a result crop produced more number of leaves. These findings corroborated with Jan *et al.* (2015). Number of functional leaves plant^{-1} was influenced significantly due to different varieties. The variety Renadu recorded significantly maximum number of functional leaves plant^{-1} (3.59, 5.19, 6.97, 10.55, 7.38) at 28, 42, 56, 70 DAS and at harvest. However, it was at par with SiA 3085 at all growth stages. Whereas, Suryanandi variety produced significantly minimum number of functional leaves plant^{-1} at 28, 42, 56, 70 DAS and at harvest. Difference in their parental origins may have created variations in their genetic inheritance, which in turn may have contributed to the variance in leaf count among various varieties. These findings were confirmed with Nandini *et al*. (2019). The interaction effect between sowing windows and varieties on number of functional leaves plant^{-1} were found to be non-significant. Dry matter plant^{-1} (g) influenced by treatments are presented in Table 1. The mean values of dry matter per plant (g) were 1.54, 4.57, 9.08, 16.49, 17.63 at 28, 42, 56, 70 DAS and at harvest respectively. The different sowing dates showed statistically significant variation in respect of dry matter production per plant (g). The crop sown on 26 MW recorded highest dry matter plant^{-1} 1.70, 5.32, 10.24, 19.32, 20.43 g at 28, 42, 56, 70 DAS and at harvest respectively which was found at par with

28 MW at 28, 70 DAS and at harvest. The crop sown on 32 MW recorded significantly lowest dry matter plant^{-1} (g) at 28, 42, 56, 70 DAS and at harvest respectively. The early-planted crop may have benefited from a longer photoperiod for vegetative growth, which allowed plants to synthesize more photosynthates and reach maximum dry matter accumulation earlier than the late-planted crop. Similar findings were observed by Hugar *et al.* (2001) and Mubeena *et al.* (2019). Among varieties, Renadu variety recorded significantly maximum dry matter accumulation per plant (1.61, 4.85, 9.60, 17.21, 18.39 g) during at 28, 42, 56, 70 DAS and at harvest respectively. It was found at par with SiA 3085 at 70 DAS and at whereas, the minimum dry matter per plant (g) was recorded in Suryanandi at 28, 42, 56, 70 DAS and at harvest respectively. This might be because of difference in source sink relationship. Dry matter production relies on the photosynthetic surface, which is also impacted by the genetic composition of plant. Similar observations were published by Raundal *et al.* (2017). The interaction effect between sowing windows and varieties on dry matter per plant (g) was reported as significant. The relevant data is presented in Table 1. The combination of 26 MW with variety Renadu recorded significantly highest dry matter production at all growth phases than rest of treatment combination. On observing the data, it was seen that the sowing windows and varieties had significant influence on days to 50 % flowering and maturity and are presented in Table 1. The mean values of days to 50 % flowering and maturity was 44.69 and 80.65. Different sowing dates and varieties showed statistically significant variation in respect of days to 50 % flowering and maturity. 26 MW registered maximum days to 50 % flowering (48.33) and maturity (81.23). In case of days to maturity, 26 MW was found to be at par with 28 MW and 30 MW. However, the minimum days to 50 % flowering and maturity was noticed in 32 MW. A review of the data showed that when the foxtail millet was sown from the 26 to 32 MW, there was a substantial impact on days to achieve 50% flowering and physiological maturity in terms of sowing windows. According to the data in Table 1 the crop sown on the 26 MW took considerably higher number of days to achieve 50% flowering stage and physiological maturity, respectively followed by 28 MW. It took fewer days for the crop sown on 32 MW to reach 50% flowering and physiological maturity. It is evident from the above findings that variations in the sowing window had a significant impact on the duration required to attain 50% flowering and physiological maturity. Compared to early-planted crops, late-planted crops need fewer days to reach 50% flowering and physiological maturity. This is because growing season of crop, from emergence to harvest, is significantly shortened when it is sown later than usual. As a result, the late-planted crop was forced to flower and reach maturity earlier than the early-planted crop, which benefited from optimal temperature in development phase and underwent later phenological growth stages. Similar results were

reported by Gochar *et al*. (2022). The days to 50% flowering and maturity were influenced significantly by different varieties. The Renadu recorded significantly maximum number of days to 50 % flowering and maturity (45.92 and 87.64), whereas minimum days required for 50 % flowering and maturity was noticed in Suryanandi. However, in case of 50% flowering, variety Renadu was found to be at par with SiA 3156. Varieties of foxtail millet had a major impact on the number of days to 50% flowering and physiological maturity. It took considerably longer for the variety Renadu to reach 50% flowering and physiological maturity stages, respectively. Conversely, variety Suryanandi was found to require the lowest number of days to reach 50% flowering and physiological maturity, since it completes the life cycle in 70-75 days and is known for its short lifespan. The interaction effects between sowing windows and varieties for days to 50 % flowering and maturity of foxtail millets were found non-significant. The yield traits of foxtail millet crop viz., number of panicle plant^{-1}, grain weight plant^{-1}, panicle length, test weight, grain and straw yield as influenced by different treatments were recorded at harvest and depicted in Table 1. The data pertaining to number of panicle plant^{-1} influenced by sowing dates and varieties are presented in Table 1. The mean values of number of panicle plant^{-1}was 4.23. The number of panicle plant^{-1} was influenced significantly due to sowing window. The 26 MW recorded maximum number of panicle plant^{-1} (4.92) which was at par with 28 MW, whereas 32 MW recorded significantly minimum number of panicles per plant. Early planting dates may have produced more panicles per plant because of favorable weather throughout the critical growth periods as well as higher number of tillers per plant. These findings are similar to f*et al.* (2016). Number of panicle plant^{-1} was influenced significantly due to different varieties. The Renadu variety recorded significantly maximum number of panicle plant^{-1} (4.43) at harvest. This was at par with SiA 3085. Whereas, the minimum number of panicle plant^{-1} recorded in Suryanandi. The difference in panicle number among varieties might be due to variation in genetic makeup. The present findings were confirmed with Jyothi *et al.* (2015) and Nandini *et al.* (2019). The interaction effects between sowing windows and varieties on panicle number plant^{-1} were found to be significant (Table 1). Highest number of panicles plant^{-1} were observed with the interaction of 26 MW and Renadu variety. Renadu variety noted more number of panicles in all the sowing dates in contrast with other varieties. Lowest number of panicles per plant were observed with Suryanandi variety when combined with various sowing windows. A critical examination of data reveals that grain weight per plant (g) influenced by sowing window and varieties are presented in Table 1. The mean value of grain weight per plant (g) plant^{-1} was 9.76. The data pertaining to grain weight plant^{-1} was influenced significantly due to different sowing dates. 26 MW sown plants produced high grain weight per plant (11.16 g) which was at par with 28

MW. 32 MW sown plants produced significantly lower grain weight plant^{-1}. Higher grain weight per plant was the result of prolonged photoperiod and better partitioning of dry matter into the reproductive parts which resulted in substantial assimilation of photosynthates. Similar observations were presented by Bammigatti *et al.* (1998). On perusal of data grain weight plant^{-1} was influenced significantly due to different varieties. Renadu produced significantly higher grain weight per plant (10.43 g) and Suryanandi produced lowest grain weight per plant (g). This might be due to higher number of panicles per plant and panicle length which in turn was caused by genetical potential of foxtail millet cultivars. These results were confirmed with Jyothi *et al.* (2015) and Srikanya *et al*. (2020). The interaction effects between sowing dates and varieties on grain weight per plant (g) were found to be significant. Renadu variety along with 26 MW produced significantly maximum grain weight plant^{-1}. The interaction of Renadu variety with all the sowing windows was found to be higher than other varieties. The data pertaining to panicle length (cm) influenced by sowing windows and varieties are presented in Table 1. The mean value of panicle length was 16.69 cm. The different sowing dates showed statistically significant variation in respect of panicle length (cm). The crop sown on 26 MW recorded maximum panicle length (20.46) which was at par with 28 MW. While significantly minimum panicle length (cm) was recorded at harvest. Early sown crop attained higher physiological growth characters which resulted in increased utilization of assimilates. This reflected in better development of reproductive traits such as panicle length. Similar outcome was suggested by Jan *et al.* (2015) and Gavit *et al*. (2017). The results revealed that the panicle length (cm) was influenced significantly due to different varieties. Renadu recorded significantly maximum panicle length (19.00 cm) and the minimum panicle lengthwas recorded in Suryanandi. Variations observed in panicle length might be related to difference in varietal features and dry matter partitioning. These findings were verified by Bammigatti *et al*. (1998); Jyothi *et al.* (2015) and Nandini *et al*. (2019). The interaction effects between sowing dates and varieties on panicle length were found significant (Table 1). Highest panicle length was observed with the interaction of sowing window of 26 MW and variety Renadu as comapared to rest of the treatment combinations. Renadu variety overall recorded more panicle length in all sowing windows. Minimum panicle length was noticed with Suryanandi variety with 26 MW, 28 MW, 30 MW and 32 MW. On perusal of the data test weight (g) of foxtail millet influenced by sowing windows and varieties, are presented in Table 1. The mean value of test weight of foxtail millet was 3.19 g. The average test weight was differed significantly due to different sowing dates. 26 MW sowing recorded higher test weight (3.67 g) which was at par with 28 MW. Whereas it was minimum in 32 MW sown crop. This suggested that the weather conditions like temperature, rainfall, humidity was beneficial for grain development during early sowing dates than delayed sowing. Also the reduction in soil moisture lead to the production of shrivelled grains in late sowing dates. These results were affirmed by Srikanya *et al.* (2020) and Mrudhula *et al.* (2020). The results revealed that the test weight (g) of foxtail millet was influenced significantly with different varieties. Renadu variety recorded significantly higher test weight (3.39 g). It was found to be at par with SiA 3085, whereas Suryanandi recorded minimum test weight. The difference in feature of cultivars might be the reason for fluctuation in test weight. These results are close to the findings of Srikanya *et al.* (2020). The interaction effect between sowing windows and varieties on test weight of foxtail millet were found significant. Variety Renadu resulted in highest test weight when interacted with 26 MW. This variety showed higher test weight in all sowing dates i.e. 26 MW, 28 MW, 30 MW and 32 MW. Whereas, lowest test wieght was revealed when Suryanandi variety was combined with all the sowing dates. The data pertaining to grain yield influenced by sowing dates and varieties are presented in Table 1. The mean value of grain yield is 14.48 q ha^{-1}. Data on grain yield was significantly affected due to different sowing dates. Maximum grain yield (17.24 q ha^{-1}) was recorded in crop sown 26 MW which was at par with 28 MW. Crop sown on 32 MW recorded significantly minimum grain yield as compared to other sowing dates. 26 MW experienced favourable temperature, well distributed rainfall and enough photoperiod during different critical growth stages which resulted in sufficient vegetative and reproductive development. This ultimately reflected into higher grain yield. The present findings were in accordance of Nandini *et al.* (2019), Mubeena *et al.* (2019) and Kiranmai *et al.* (2021). The grain yield was influenced significantly due to different varieties. Renadu variety recorded significantly maximum grain yield (15.63 q ha^{-1}) whereas Suryanandi variety produced significantly minimum yield. Genetic potential of foxtail millet along with higher growth and yield attributes may be the cause of variation in grain yield amongst foxtail millet variants. These findings were similar with Jyothi *et al.* (2015) and Srikanya *et al.* (2020). The interaction effect between sowing windows and varieties on grain yield (q ha^{-1}) were found to be significant which is reported in Table 1. Compared to the other interactions, the interaction of Renadu variety with sowing dates of 26 MW, 28 MW, 30 MW, and 32 MW produced substantially higher grain yield. However, a declining trend in the grain production of foxtail millet was seen when the varieties SiA 3156, SiA 3085, Suryanandi, and Renadu were combined with sowing dates of 28 MW, 30 MW, and 32 MW. The findings indicated that delayed sowing of foxtail millet varieties caused the plant could not assimilate more biomass, which in turn decreased the grain yield. From the data, it was seen that the sowing windows and varieties had significantly influenced straw yield and are presented in Table 1. The average value straw yield was 23.49 q ha^{-1}. Different sowing dates showed statistically significant variation in respect of straw yield. 26 MW registered maximum straw yield (26.97 q ha^{-1}) which was at par with 28 MW. However, the minimum straw yield was observed in 32 MW. The decline in number of harvested plants along with reduction in plant height and dry matter accumulation, contributed to lower straw yield. These results were comparable with Mubeena *et al.* (2019) and Nandini *et al.* (2019). Straw yield was influenced significantly by different varieties. The Renadu variety recorded maximum straw yield (25.05 q ha^{-1}) which was found to be at par with SiA 3085, whereas minimum recorded in Suryanandi. Significant difference in the amount of straw yield obtained were caused by improved development of several growth characteristics like plant height, number of leaves, dry matter concentration which was caused due to contrast in varietal characters. The interaction effects between sowing windows and varieties for straw yield of foxtail millet were found significant. Variety Renadu recorded highest straw yield in interaction with 26 MW compared to other treatment combinations. The data presented in Table 1 indicated that the harvest index was observed in the range of 36.9 to 38.9 under different sowing dates and varieties. The data on harvest index did not differ significantly due to different dates of sowing. However, early sowing in 26MW resulted in highest harvest index (38.9) than other treatments. Varieties did not have significant effect with respect to harvest index. Highest harvest index was recorded with Renadu variety (38.2), followed by SiA 3085 variety. A non-significant impact was noted due to the interaction of dates of sowing and varieties with respect to harvest index.

Conclusion

26 MW and 28 MW for sowing of foxtail millet was most suitable to obtain maximum growth and yield during *kharif* season. Sowing of Renadu variety resulted in obtaining maximum growth and yield as compared to other varieties. Renadu variety sown on 26 MW was most suitable interaction for sowing of foxtail millet to obtain highest grain and straw yield than other treatment combinations. It was followed by SiA 3085 variety for important growth characters of number of tillers and dry matter production and for yield contributing characters.

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Table 1: Phenology, growth, yield and yield attribute of foxtail millet as influenced by different treatments

Treatment	Days to 50% flowering	Days to maturity	Plant height (cm)					Number of tillers plant^{-1}				
			28 DAS	42 DAS	56 DAS	70 DAS	At harvest	28 DAS	42 DAS	56 DAS	70 DAS	At harvest
A) Sowing windows												
S_1- 26 MW (25th June - 01st July)	48.33	81.23	29.47	74.16	95.13	139.58	140.42	1.82	2.15	3.79	3.13	3.13
S_2- 28 MW (9th - 15th July)	45.58	81.08	20.28	60.61	84.06	129.45	129.95	1.71	1.86	3.49	2.77	2.77
S_3- 30 MW (23rd - 29th July)	43.58	80.77	16.94	46.73	75.89	119.53	120.2	1.48	1.62	3.19	2.58	2.58
S_4- 32 MW (6th - 12th Aug)	41.25	79.53	14.03	38.25	66.27	107.79	109.46	1.36	1.56	3.03	2.42	2.42
SEm ±	0.41	0.24	2.56	1.55	1.27	2.06	2.01	0.04	0.07	0.11	0.13	0.13
CD at 5%	1.43	0.83	8.84	5.35	4.41	7.11	6.96	0.14	0.24	0.37	0.44	0.44
B) Varieties of foxtail millet												
V_1- SiA 3156	44.92	85.52	19.57	53.51	79.67	121.93	122.76	0.97	1.69	3.2	2.51	2.51
V_2- SiA 3085	44.17	79.62	21.11	56.85	80.88	126.11	127.61	1.48	1.79	3.33	2.63	2.63
V_3- Suryanandi	43.75	69.84	18.73	50.61	76.57	119.38	119.96	0.94	1.19	2.39	1.76	1.76
V_4- Renadu	45.92	87.64	21.3	58.77	84.23	128.95	129.7	2.95	2.51	4.58	4	4
SEm±	0.45	0.53	0.37	1.05	1.5	1.54	1.58	0.03	0.05	0.09	0.04	0.04
CD at 5%	1.31	1.56	1.09	3.07	4.37	4.48	4.6	0.14	0.21	0.26	0.12	0.12
C) Interaction (SxV)												
SEm ±	0.9	0.96	2.64	2.39	2.89	3.36	3.39	0.07	0.11	0.19	0.15	0.15
CD at 5%	NS	NS	NS	NS	NS	NS	NS	0.22	0.33	0.59	0.48	0.48
General mean	44.69	80.65	20.18	54.94	80.34	124.09	125.01	1.58	1.8	3.37	2.73	2.73

Continue….

Treatment	Number of functional leaves plant^{-1}					Dry matter per plant (g)				
	28 DAS	**42 DAS**	**56 DAS**	**70 DAS**	**At harvest**	**28 DAS**	**42 DAS**	**56 DAS**	**70 DAS**	**At harvest**
A) Sowing windows										
S_1- 26 MW (25th June - 01st July)	4	5.9	7.85	11.89	8.32	1.7	5.32	10.24	19.32	20.43
S_2- 28 MW (9th - 15th July)	3.63	5.05	6.89	10.43	7.3	1.65	4.91	9.82	17.65	18.96
S_3- 30 MW (23rd - 29th July)	3.28	4.76	6.34	9.61	6.73	1.52	4.29	8.67	15.4	15.4
S_4- 32 MW (6th - 12th Aug)	2.78	4.32	5.77	8.73	6.11	1.28	3.74	7.59	13.61	13.61
SEm ±	0.1	0.07	0.14	0.04	0.03	0.02	0.06	0.09	0.49	0.44
CD at 5%	0.34	0.23	0.47	0.15	0.11	0.06	0.19	0.31	1.7	1.53
B) Varieties of foxtail millet										
V_1- SiA 3156	3.36	4.97	6.67	10.1	7.07	1.53	4.58	8.86	16.11	17.24
V_2- SiA 3085	3.47	5.05	6.8	10.31	7.22	1.55	4.64	9.19	16.8	17.91
V_3- Suryanandi	3.27	4.82	6.41	9.69	6.79	1.46	4.19	8.66	15.75	16.99
V_4- Renadu	3.59	5.19	6.97	10.55	7.38	1.61	4.85	9.6	17.21	18.39
SEm±	0.06	0.08	0.1	0.14	0.11	0.02	0.07	0.1	0.19	0.23
CD at 5%	0.17	0.24	0.29	0.42	0.31	0.05	0.2	0.3	0.56	0.67
C) Interaction (SxV)										
SEm ±	0.14	0.16	0.22	0.25	0.19	0.04	0.13	0.2	0.59	0.6
CD at 5%	NS	NS	NS	NS	NS	0.11	0.39	0.61	1.94	1.92
General mean	3.42	5.01	6.71	10.16	7.11	1.54	4.57	9.08	16.49	17.63

Continue….

Treatment	Number of panicles plant^{-1}	Grain weight plant^{-1} (g)	Panicle length (cm)	Test weight (g)	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})	Harvest Index
A) Sowing windows							
S_1- 26 MW (25th June - 01st July)	4.93	11.31	20.46	3.67	17.24	26.97	38.9
S_2- 28 MW (9th - 15th July)	4.53	10.42	18.11	3.55	15.59	24.71	38.5
S_3- 30 MW (23rd - 29th July)	4.09	9.27	15.69	2.84	13.6	23.16	37.7
S_4- 32 MW (6th - 12th Aug)	3.36	8.03	12.31	2.68	11.48	19.1	36.9
SEm ±	0.21	0.3	1.03	0.14	0.57	0.64	0.91
CD at 5%	0.74	1.02	3.55	0.5	1.98	2.2	NS
B) Varieties of foxtail millet							
V_1- SiA 3156	4.07	9.41	15.88	3.19	14.03	22.6	37.9
V_2- SiA 3085	4.37	9.99	17.56	3.3	14.86	24.17	38.2
V_3- Suryanandi	3.92	9.2	14.39	2.86	13.38	21.98	37.6
V_4- Renadu	4.55	10.43	19.34	3.39	15.63	25.05	38.2
SEm±	0.07	0.12	0.24	0.05	0.25	0.31	0.5
CD at 5%	0.2	0.34	0.71	0.14	0.73	0.9	NS
C) Interaction (SxV)							
SEm ±	0.25	0.36	1.11	0.17	0.71	0.83	1.01
CD at 5%	0.82	1.17	3.75	0.55	2.34	2.69	NS
General mean	4.23	9.76	16.79	3.19	14.48	23.45	38

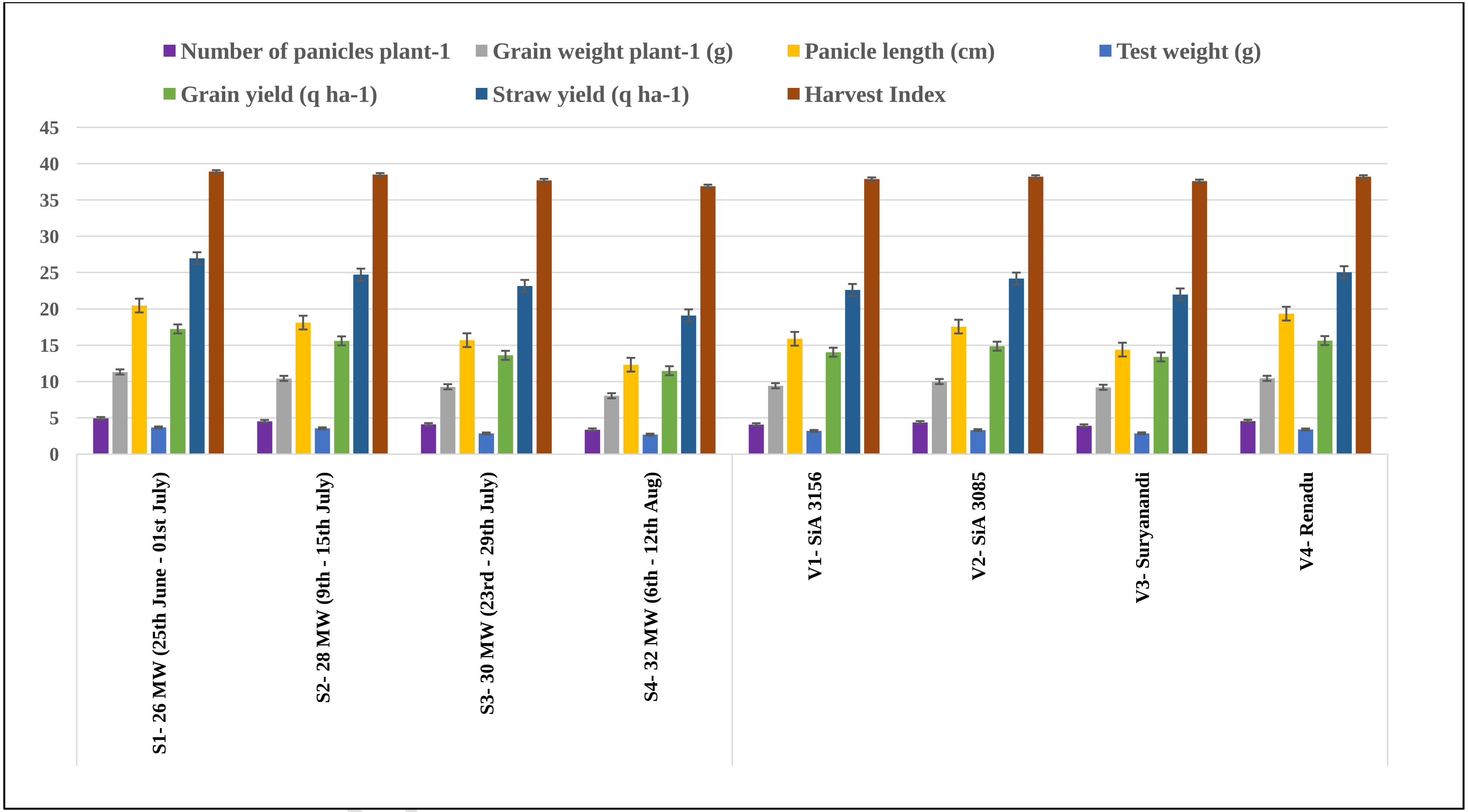

Fig. 1: Yield and yield attribute of foxtail millet as influenced by different treatments