Carrying Capacity and Productivity of Sorghum Samurai 1, Samurai 2, Patir 37 and Pahats in the Tampusu Livestock Area North Sulawesi Province

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Abstract.This research aims to analyze the productivity and carrying capacity of several sorghum varieties planted in coconut plantation areas. This research used a Completely Randomized Design (CRD) consisting of 4 different varieties and 5 replications to obtain 20 experimental units. The sorghum planting varieties studied consisted of V1 = Samurai 1, V2 = Samurai 2, V3 = Patir 37, and V4 = Pahat. The variables measured consist of dry matter content, dry matter production and carrying capacity. The results of analysis of variance showed that varieties had very significantly different effects (P<0.01) on dry matter content, dry matter production and carrying capacity. HSD tests showed that the Super 2 assortment had leaf and stem dry matter substance, leaf dry matter creation and carrying capacity which were altogether (P<0.01) higher than the Samurai 1, Patir 37 and Pahat assortments, while the Samurai 1 assortment delivered leaf dry matter substance and creation were essentially (P<0.01) higher an the Samurai 2, Patir 37 and Pahat assortments. It was reasoned that the Samurai 1 and Samurai 2 assortments gave the most noteworthy outcomes in dry matter substance, dry matter creation and carrying capacity.

Key words: Dry matter content, produktivity, carrying capacity, sorghum

INTRODUCTION

Forage is the main feed for ruminant livestock which plays a very important role in growth, production and reproduction. In order to achieve optimal growth of ruminant livestock, it must be supported by the provision of sufficient forage in quality, quantity and continuity (Hajar *et al*, 2019). Exploratory endeavors to get creature feed establishes that have high efficiency and can endure the land and environment conditions in Indonesia. One sort of rummage that can possibly be created as ruminant feed is sorghum.

Sorghum is remembered for the graminae family, can possibly be developed financially in Indonesia since it enjoys different benefits, including having a genuinely elevated degree of transformation to environmental change (Yusuf, *et al* 2017), more impervious to dry spell than corn and elephant grass so it can possibly be created in dry regions, can be replanted up to 4 times each year, can endure waterlogging so this plant can fill in both the blustery and dry seasons (Sirappa, 2003). Sorghum has great potential to be developed as a source of carbohydrates (Yahfi, *et al* 2017). Protein content 29.76%, crude fiber 34.5%, fat content ±2.4%, carbohydrate content ±72.9% (Telleng *et al*. 2016; Malalantang *et al.* 2019). Nearby sorghum creation and quality is still exceptionally low contrasted with imported items, so endeavors are expected to further develop plant assortments through plant rearing projects (Soeranto 2011; Malalantang *et al*.2023). Sorghum has many advantages, but is still rarely cultivated in Indonesia (Syarifah, 2015) even though it has very good potential to meet food or feed needs in Indonesia (Pithaloka *et al*. 2015). One of the efforts made is by introducing or introducing new varieties of sorghum plants. Blummel et al. (2003) stated that sorghum varieties or introductions as animal feed have great potential for increasing forage.The presentation of new sorghum assortments has a few advantages, remembering expanding the variety of sorghum assortments for Indonesia for feed, as cross-rearing material or straightforwardly delivering them as assortments in the wake of being tried for variation (Syukur *et al.* 2012). Hereditary variety is key for further developing yields (Sharma et al. 2014). This examination was led to break down a few sorghum assortments established under coconut stands that would give the most elevated efficiency and conveying limit.

MATERIALS AND METHODS

Studi area

This research was carried out from April to August 2023 in an area of ±500 m^2 in the experimental garden in Balai Pengembangan bibit dan paka ternak Tampusu Village, Minahasa District, North Sulawesi Province, Indonesia (Figure 1).

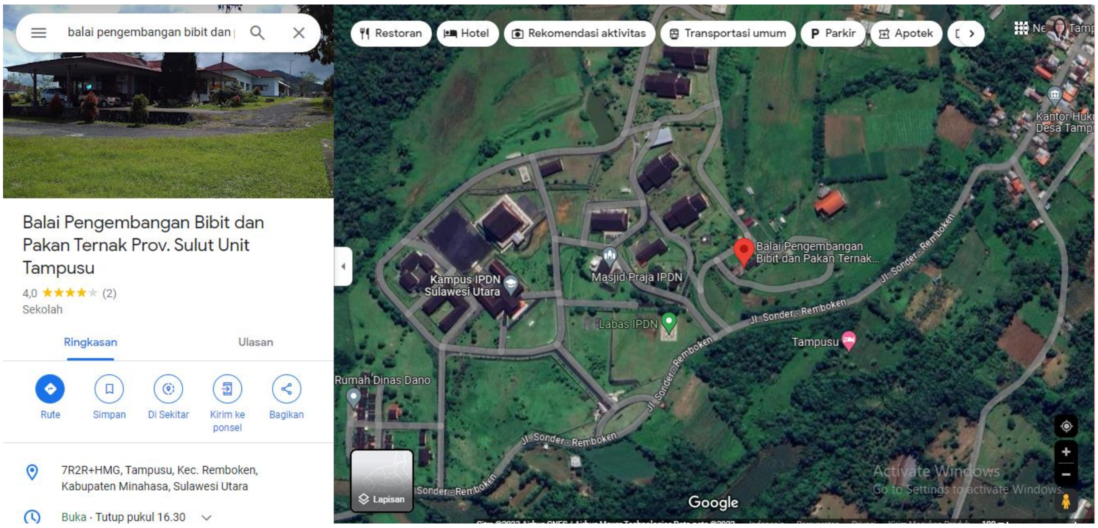

Figure 1. Tampusu Village Disrtrict Minahasa, North Sulawesi

Instruments and materials

The devices utilized in this examination were tools, scoops, meters, paper, sugar plastic, raffiah rope, and bamboo stakes. The materials utilized in this examination are sorghum seeds from BRIN Indonesia.

Research method

1. Land readiness
   The land utilized in this examination was handled physically, cleaned utilizing a handsprayer, digger and blade. So it is liberated from wild grass or weeds. Then turning the dirt and digging expects to release the dirt with the goal that the land is prepared for planting. The exploration plot was made with aspects of 3m x 3m.
2. Planting
   Establishing sorghum seeds is finished involving a technique in the tugal. Seeds are established in a plot estimating 3m x 3m with a dispersing of 25cm x 25cm. In each opening, sorghum seeds are planted to a profundity of 3 cm.
3. Maintenance
   Treatment is completed 14 days subsequent to planting (DAT), the compost given is NPK manure. Upkeep is completed by watering two times per day and cleaning weeds in the establishing plot a few times each day.
4. Perception
   Perceptions were made consistently until the delicate mixture stage. The temperature was recorded consistently, and when like clockwork, plant level was estimated, stem distance across, number and width of leaves were recorded on each plant noticed.

Experimental design

This research used a Completely Randomized Design (CRD) consisting of 4 treatments and 5 replications, so there were 20 experimental units. The sorghum plant varieties tested were: V1 = Samurai 1; V2 = Samurai 2; V3 = Patir 37; V4 = Pahat

Factors Estimated

1. Weight of dry leaf material
   The dry matter load of the leaves is determined in view of duplicating the new weight of the leaves by the dry matter substance of the leaves (g/plant)
2. Weight of dry stem material

The dry matter load of the stem is determined in view of duplicating the new weight of the stem by the dry matter substance of the stem (g/plant).

3. Weight of panicle dry material
   Panicle dry matter weight was determined in view of duplicating the panicle new weight by the panicle dry matter substance (gr/plant).
4. Total dry material creation
   All out dry matter creation was determined in view of the heaviness of leaf dry matter, stem dry matter weight and panicle dry matter weight.
5. Carrying capacity
   It is expected that domesticated animals consume 6.29 kg of scavenge DM/day/head (Indonesian circumstances). How much dry matter expected to give 6.29 kg of edible supplements in light of accessible scavenge (70% appropriate utilized factor) is 9.0 kg.

RESULTS AND DISCUSSION

A. Results

Dry matter Content

The dry matter (DM) substance of sorghum plants as estimated by DM Stem, DM leaf, Production DM Stem, and Carryng capacity should be visible in Table 1.

Table 1. Dry Matter Content, Production and Carrying Capacity.

Varietas	Quality and Productivity					
	DM Stem (%)	DM Leaf (%)	Prod. DM Stem (ton/ha)	Prod. DM (ton/ha)	Prod. DM Total (ton/ha/Yr)	Carrying capacity (UT/ha/Yr)
Samurai 1	93.83^a	94.85^b	19.89^a	2.39^b	66.83^a	17.44^a
Samurai 2	93.95^a	95.06^a	17.83^b	2.77^a	61.79^b	16.12^b
Patir 37	93.21^b	89.01^d	13.38^c	2.39^b	47.29^c	12.34^c
Pahat	88.48^c	89.99^c	7.77^d	2.37^c	30.43^d	7.94^d
P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
MSE	0.0434	0.0400	0.0088	0.0041	0.0281	0.0073

Note: Superscript abcd in the same column shows a very significant difference (P<0.01).

Nutritional Value Dry matter of stems and leaves

The average stem dry matter ranged from 88.48% produced by the Pahat variety to 93.95% produced by the Samurai 2 variety. The results of diversity analysis showed that sorghum varieties had very significantly different effects (P<0.01) to the percentage of stem dry matter. The HSD test showed that the Samurai 2 sorghum variety had a very significantly (P<0.01) higher stem dry matter percentage than the Patir 37 and Pahat varieties, but was not significantly different (P>0.05) from the Samurai 1 variety.

The average leaf dry matter content ranged from 89.01% produced by the Patir 37 variety to 95.06% produced by the Samurai 2 variety. The results of diversity analysis showed that sorghum varieties had very significantly different effects (P<0.01) to the percentage of leaf dry matter. The HSD test showed that the Samurai 2 sorghum variety had a very significantly (P<0.01) higher stem dry matter percentage than the Samurai 1, Patir 37 and Pahat varieties.

Production of dry stems and leaves

The typical stem dry matter went from 7.77 tons/ha delivered by the Pahat assortment to 19.89 tons/ha delivered by the Samurai 1 assortment. The consequences of variety investigation showed that sorghum assortments made essentially various impacts (P <0.01) on stem dry matter creation. The HSD test showed that the Samurai 1 sorghum assortment delivered stem dry matter creation which was essentially (P<0.01) higher than the Samurai 2, Patir 37 and Pahat assortments.

The typical dry leaf matter creation went from 2.37 tons/ha delivered by the Pahat assortment to 2.77 tons/ha created by the Samurai 2 assortment. The aftereffects of variety investigation showed that sorghum assortments made altogether various impacts (P <0.01) on leaf dry matter creation. The HSD test showed that the Samurai 2 sorghum assortment delivered leaf dry matter creation which was fundamentally (P<0.01) higher than the Samurai 2, Patir 37 and Pahat assortments.

Total Production and Carryng Capacity

The average total dry matter production of sorghum plants as measured by total dry matter production, as well as the carrying capacity of the research results can be seen in Table 1.

Total Dry Matter

The typical complete dry matter creation because of the exploration should be visible in Table 1. The typical all out dry matter creation goes from 30.43 tons/ha/yr delivered by the Pahat assortment to 66.83 tons/ha/yr delivered by Samurai assortment 1. The consequences of variety investigation showed that sorghum assortments made a fundamentally unique difference ($P<0.01$) on all out dry matter creation. The HSD test showed that the Samurai 1 sorghum assortment delivered a complete dry matter creation that was essentially ($P<0.01$) higher than the Samurai 2, Patir 37 and Pahat assortments.

Carrying capacity

The average carrying capacity of the research results can be seen in Table 1. The average carrying capacity ranges from 7.94 ST/ha/yr produced by the Pahat variety to 17.44 ST/ha/yr produced by the Samurai 1 variety. The results of diversity analysis showed that sorghum varieties had very significantly different effects ($P<0.01$) on carrying capacity. The BNJ test showed that the Samurai 1 sorghum variety produced a very significantly ($P<0.01$) higher carrying capacity than the Samurai 2, Patir 37 and Pahat varieties.

Discussion

One way to determine plant growth is by measuring the amount of biomass of a plant. Biomass can be measured using the dry weight of the plant. The dry weight of the shoot shows the amount of biomass absorbed by the plant. Biomass is an accumulation of various food reserves such as protein, carbohydrates and fat. The high productivity of sorghum varieties Samurai 1 and Samurai 2 is thought to be due to an increase in cytokinin activity which is more active in Kawali sorghum, resulting in more active cell division which results in higher productivity. Cytokinin is a hormone originating from plant growing points which functions to stimulate the growth of stem tip cells and accelerate the division activity of growing point cells (Taiz and Zieger, 2010).

Plant growth itself can be considered as an increase in fresh weight and accumulation of dry matter. The better the plant growth, the dry weight will also increase. Differences in growth characteristics between cultivars are due to differences in genetic structure, genotypic differences in the concentration of mineral elements, and cultivar differences in partitioning the results of photosynthesis between plant organs (Hassanein et al. 2010). Genes influence the size and shape of a plant's body. This is because genes function to regulate enzyme synthesis to control chemical processes in cells. Apart from genes, the internal factor that determines plant growth is hormonal activity. Hormones influence responses in plant parts such as roots, stems and leaves. The response depends on the species, plant part, developmental phase, and hormone concentration.

Differences in sorghum varieties will affect the productivity and quality of sorghum plants (Telleng, 2017). The high dry matter content of the Samurai 1 and Samurai 2 varieties is closely related to the intrinsic characteristics of the genotype which is highly adaptable to various regions, which allows it to achieve the highest yields, with high productive potential, these characteristics are correlated with the genetic composition of the material and the growing environment (Costa et al. 2016). Plant dry weight is the net result of CO2 assimilation carried out during plant growth and development. The greater the biomass of a plant, the metabolic processes in the plant run well, and vice versa, if the biomass is small, it indicates that there is an obstacle in the plant's metabolic process (Fahrudin , 2009).

Plant dry weight indicates the plant's pattern of accumulating products from the photosynthesis process and is an integration with other environmental factors, so that dry weight is closely related to biomass. The higher the biomass, the heavier the dry weight. Increased weight of plants or plant parts due to the addition of new structural elements. Growing cells require various factors, both from within the cell itself and from outside. The internal factor that determines plant growth is hormonal activity. Plant species are included in categories that determine the growth and/or development of a plant. Plant growth factors originate from internal plant bodies, namely genetics and hormonal activities.

Carrying capacity is the ability to analyze an area of pasture land to accommodate a number of livestock, so that forage needs are adequately met in one year, Rinaldi et al., (2012); Rusnan et al., (2015). Grazing carrying capacity reflects the balance between available forage and the number of livestock units grazed per unit of time (Rusdin et al., 2009). Carrying capacity is closely related to the productivity of forage in a livestock grazing area. The higher the forage productivity in a pasture area, the higher the livestock carrying capacity as indicated by the number of livestock that can be grazed (Reksohadiprodjo, 1994).

CONCLUSION

From the results of the analysis of productivity and carrying capacity of the Samurai 1 variety, Samurai 2 variety, Patir 37 variety and Pahat varie ty, it can be concluded that the Samurai 2 variety provides the highest yield in dry matter percentage and stem dry matter production, as well as carrying capacity.

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