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Potential of Kirinyuh Weed (Chromolaena odorata) As a Source of Green Fertilizer in Two District in Kuantan Singingi District

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ABSTRACT

Kuantan Singingi Regency is dominated by marginal soil with the order of soil. The use of Ultisol for the cultivation of problematic plants with poor organic matter and nutrients needs to be overcome by giving organic matter. One of the potential sources of organic fertilizer in Kuantan singingi district is kirinyuh bush (Chromolaena odorata). This study has the objectives of 1) knowing the contribution of biomass and the distribution of kirinyuh. and 2) To determine the potential of kirinyuh as a source of organic fertilizer through the C, N, P and K nutrients it contains. This research is a field research that will be carried out using a survey method with purposive sampling. Kirinyuh's observation locations were in two sub-districts in Kuantan Singingi Regency, namely Kuantan Hulu Kuantan District and Mudik Kuantan Singingi Regency. The results of this study can be concluded that kirinyuh is widely available and easy to obtain in Kuantan singingi Regency and contains high nutrients so that it is very potential to be used as a source of organic fertilizer in the form of green manure. Kirinyuh weed in Kuantan singingi has not been utilized and is often found living in groups on the outskirts of land, roads, rice fields, shrubs and irrigation. Kirinyuh biomass as a source of organic matter varies, generally every 1m2 produces about 2-3 kg of biomass. The results of laboratory analysis, kirinyuh leaves contain nutrients of 42.95% C-organic, 4.41 %N, 1.032 %P and 3.05%K, while the stem contains 45.68% C-Organic.

Key words : *Potential, organic matter, Weeds, Kirinyuh, Green Manure*

1. INTRODUCTION

Soil has a very important meaning for plants. Soil fertility determines the success rate of plant cultivation. Based on the annual report of the Kuantan Singingi Food Crops Service, red yellow Podsolic soil or in taxonomic classification known as ultisol is the dominant soil in Kuantan singingi Regency. Ultisols in this district have a soil acidity level of about 4.7 -5. According to Sujana and Pura (2015) Obstacles in using Ultisol soil for agricultural development are high acidity and Al saturation, low nutrient and organic matter content, and soil sensitive to erosion**.**

Farmers in Kuantan Singingi district have been using artificial fertilizers in an effort to increase the fertility of the Ultisol soil. The problem is that artificial fertilizers are currently expensive and scarce. Therefore, there must be an effort to find sources of organic matter that can overcome these problems without reducing production, for example the use of cheap and easily available organic materials in the area itself as a source of in situ organic fertilizers.

The potential source of organic matter as green manure is kirinyuh weed. Based on the results of the pre-survey in Kuantan Singingi Regency, kirinyuh weeds were found in various land uses because kirinyuh is an invasive weed. Yuliana and Lekitoo (2018) stated that kirinyuh is an invasive plant, namely a plant that has the characteristics of being able to grow and develop quickly, widely distributed and has a high tolerance for life in an unfavorable environment Nugroho, Mildaryani and Candra Dewi (2019) reported that the biomass production of Siam or kiriyuh weed was very high reaching 80 tons of fresh biomass ha-1 at a density of 24-37 individuals m-2 and spread in almost all locations in the Special Region of Yogyakarta. Kirinyuh also contains high levels of nutrients, namely 2.56% N, 0.38% P, and 2.41% K.

Based on this background, kirinyuh weed in Kuantan Singingi district certainly needs to be known about its number and existence so that it can be used as organic fertilizer in situ. However, how much potential it has to produce a potential source of organic matter for green manure in Kuantan Singingi Regency is not yet known. Information regarding the distribution pattern of kirinyuh and the nutrient content of kirinyuh in Kuantan Singingi district is also unknown. Given the large number of plantations and agricultural lands in Kuantan Singingi Regency, of course this source of green manure is the right solution to the problem of soil fertility and dependence on artificial fertilizers in Kuantan Singingi Regency. This study aims to determinethe potential of kirinyuh weed (Chromolaena Odorata) as a source of green manure in Kuantan Singingi Regency.

2. MATERIALS AND METHODS

Place and time

This research has been carried out in two sub-districts in Kuantan Singingi Regency, namely Hulu Kuantan and Kuantan Mudik Districts. This research consists of two stages, namely in the field and in the soil chemistry laboratory, Andalas University, Padang. The duration of the research is from November 2021 to January 2022.

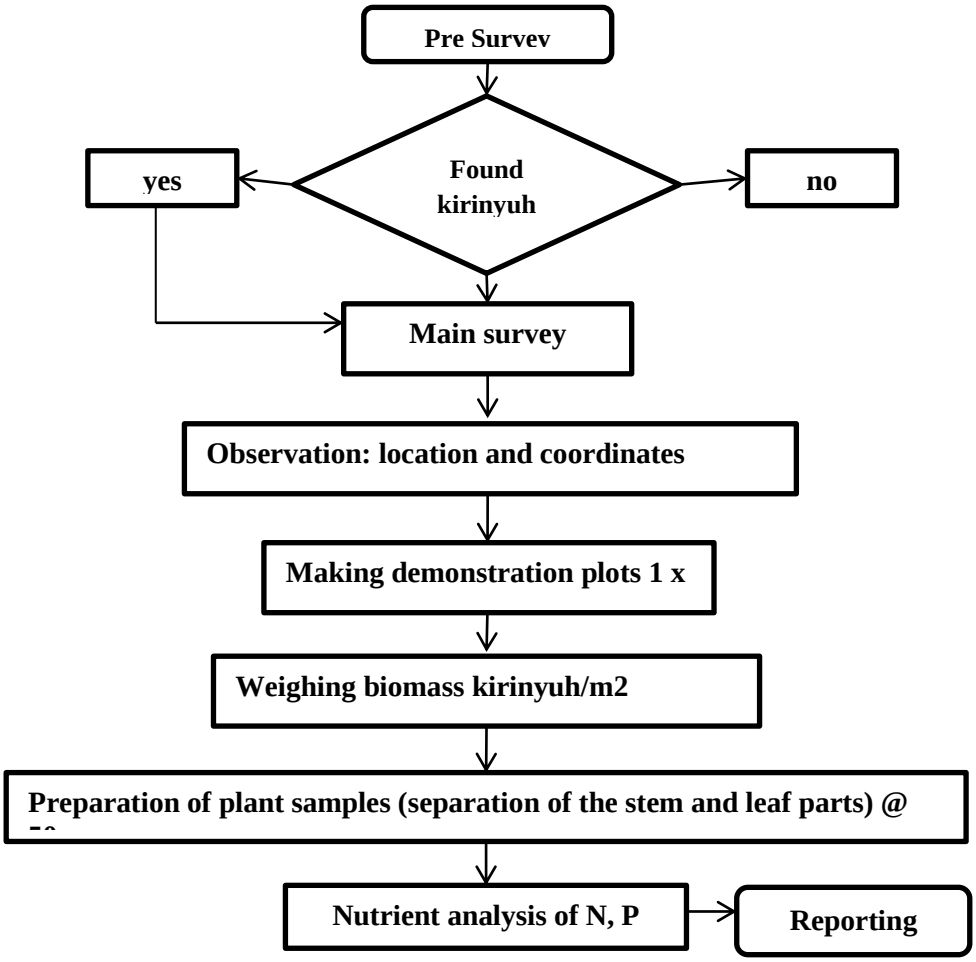
Tools and Materials

The tools used in this study include machetes, hoes, rapia rope, GPS

avenzamap, administrative maps, command knives, spring scales, pH meters, ovens, desiccators, AAS, and other chemical tools. Meanwhile, the materials used in this laboratory research are 1N KCL, 0.1N NaOH, PP indicator (phenolptalein), 4% NaF, distilled water/aquades, 0.1N HCl, ammonium acetate pH 7 1N.

Research methods

This research consisted of two stages, namely the field and laboratory stages. The field stage uses a survey method by determining the location of observations and purposive sampling, which is in accordance with the purpose of the study which is carried out at locations where kirinyuh weeds are present. The laboratory stage consisted of nutrient analysis of N, P and K in the stems and leaves of kirinyuh. The flow chart of the research implementation can be seen in Diagram 1.



Analysis of N, P and K nutrient content in the Laboratory

Analysis of the nutrient content in the stem and leaf tissue of kirinyuh in the laboratory includes:

1. Determination of C-Organic by dry ashing method
2. Determination of Nitrogen and Phosphorus content using the Kjeldahl method (wet digestion)
3. Determination of C/N by comparison method (ratio)

4. Determination of K content using the Kjeldahl method (wet destruction) and the Flamephotometric method.

3. RESULTS AND DISCUSSION

Location and pattern of distribution of kirinyuh weed

Based on research that has been conducted on the spread of kirinyuh weed in Hulu Kuantan and Kuantan Mudik subdistricts, it was found that kirinyuh weeds were found in different locations but with the same distribution pattern. Location data and distribution of kirinyuh weed can be seen in Table 1.

Table 1.Location and distribution pattern of kirinyuh weed in Hulu Kuantan and Kuantan Mudik sub-districts, Kuantan Singingi district

No	Location (Village)	Sample coordinate point	Location	Spread pattern
A	**Hulu Kuantan District**			
1	Lubuk Ambacang	1. 0o37'15.7" S 101o23'52.8" E 2. 0o37'15.6" S 101o23'52.3" E 3. 0o37'19.6" S 101o23'47.2" E	Side of the road Side of the road Side of the road	group group group
2	Sungai kelelawar	1. 0o37'53.3" S 101o24'34.1" E 2. 0o37'58.6" S 101o24'35.5" E 3. 0o38'00,6" S 101o24'34.0" E	Side of the road Shrubs Shrubs	group group group
3	Sungai alah	1. 0o37'02.8" S 101o24'26.8" E 2. 0o36'45.2" S 101o24'20.6" E 3. 0o36'40.3" S 101o24'19.6" E	Garden side Side of the road Side of the road	group group group
B.	**Kuantan Mudik District**			
1	Bukit kauman	1. 0o38'31.9" S 101o26'23.6" E 2. 0o38'29.4" S 101o26'18.8" E 3. 0o38'30.4" S 101o26'19.7" E	Side of the road Side of the road Side of the road	group group group
2	Aur duri	1. 0o38'53.4" S 101o26'38.6" E 2. 0o38'53.7" S 101o26'39.2" E 3. 0o39'10.4" S 101o26'52.7" E	Side of the road Side of the road Side of the road	group group group
3	Kinali	1. 0o38'49.2" S 101o27'13.0" E 2. 0o38'48.8" S 101o27'13.3" E 3. 0o38'46.2" S 101o27'14.1" E	Riverbank Riverbank Riverbank	group group group
4	Sungai manau	1. 0o38'10.0" S 101o25'08,8" E 2. 0o37'51.3" S 101o25'15.6" E 3. 0o37'44.6" S 101o25'18.8" E	Side of the road Rice Fields Garden side	group group group
5	Muaro Tombang	1. 0o37'37.3" S 101o24'39.0" E 2. 0o37'35.4" S 101o24'41.5" E 3. 0o37'35.2" S 101o24'42.1" E	Side of the road Side of the road Side of the road	group group group

Based on the data in Table 1, it can be seen that in the upstream district of Kuantan, the location for the spread of kirinyuh weed in 3 villages in the area, namely Lubuk Ambacang Village, Bat River and Alah River, the distribution was found to be mostly on the side of the road and then on the edge of the garden and shrubs. Meanwhile, in Kuantan Mudik sub-district, it was found that kirinyuh distribution was

more varied, namely at the edge of the road, then along the river, shrubs and the edges of rice fields. In Sungai Manau Village, the presence of kirinyuh on the outskirts of rice fields and gardens is often found. While in the village of Kinali more often found on the banks of the river. This is because Desakinali is administratively located on the outskirts of the Kuantan river.

Based on Table 1, it can also be seen that kirinyuh weed in two sub-districts in Kuantan singingi district has a clustered distribution pattern. Kirinyuh weeds were found to live in groups at various locations and dominate at one location. Life dominates kirinyuh weeds at a point in the location because this weed is an invasive weedwhich means that the species is capable of invading the environment and has the ability to dominate an area of land over native plants.Documentation of the location of kirinyuh in two sub-districts in Kuantan Singingi district can be seen in Figure 1.

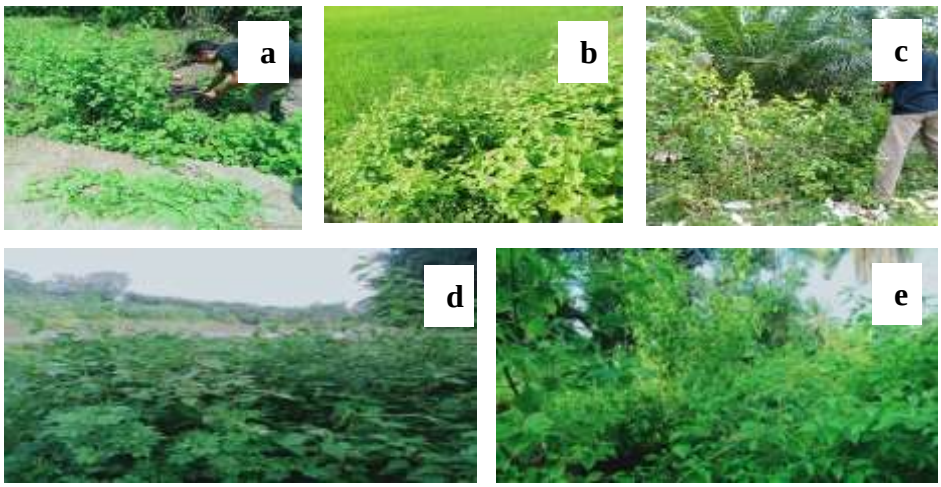


Figure 1. Location of kirinyuh distribution in two sub-districts in Kuantan Singingi district. (a) the side of the road, (b) the edge of the fields, (c) the edge of the garden, (d) the edge of the river, and (e) the shrubs

In Figure 1 it can be seen that kirinyuh weed can live in various locations because it is an invasive weed. It can be seen that the location on the riverbank of kirinyuh development is better due to the availability of water and more fertile soil.According to FAO (2006) stated tThis plant is very fast to grow and reproduce. Due to its rapid reproduction and growth, this weed quickly also forms dense communities so that it can inhibit the growth of other plants through competition. Kirinyuh can grow at an altitude of 1000 – 2800 m above sea level, but in Indonesia it is commonly found in the lowlands (0 – 500 m above sea level) such as in Indonesia.

rubber and coconut plantations as well as in pastures.

4.2 Potential of kirinyuh weed biomass in Kuantan district singingi

Kirinyuh weed in Kuantan Singingi Regency based on the results of the 1 x 1 m demonstration plot, it was found that the fresh biomass of kirinyuh varied at each sampling location. The potential of kirinyuh weed biomass in Kuantan singingi Regency can be seen in Table 2.

Table 2.Potential of kirinyuh weed biomass in Kuantan singingi district in Hulu Kuantan and Kuantan Mudik sub-districts, Kuantan Singingi district

No	Location (Village)	Sample coordinate point	Fresh biomass (kg/per m2)	Average FFB (kg/per m2)
A	Hulu Kuantan District			
1	Lubuk Ambacang	1. 0o37'15.7" S 101o23'52.8" E 2. 0o37'15.6" S 101o23'52.3" E 3. 0o37'19.6" S 101o23'47.2" E	2.29 2.80 1.85	2.31
2	Sungai kelelawar	1. 0o37'53.3" S 101o24'34.1" E 2. 0o37'58.6" S 101o24'35.5" E 3. 0o38'00,6" S 101o24'34.0" E	2.58 2.50 3.33	2.80
3	Sungai alah	1. 0o37'02.8" S 101o24'26.8" E 2. 0o36'45.2" S 101o24'20.6" E 3. 0o36'40.3" S 101o24'19.6" E	0.20 2.00 7.37	3.19
B.	Kuantan Mudik District			
1	Bukit kauman	1. 0o38'31.9" S 101o26'23.6" E 2. 0o38'29.4" S 101o26'18.8" E 3. 0o38'30.4" S 101o26'19.7" E	1.90 1.84 2.00	1.90
2	Aur duri	1. 0o38'53.4" S 101o26'38.6" E 2. 0o38'53.7" S 101o26'39.2" E 3. 0o39'10.4" S 101o26'52.7" E	2.16 1.60 0.45	1.40
3	Kinali	1. 0o38'49.2" S 101o27'13.0" E 2. 0o38'48.8" S 101o27'13.3" E 3. 0o38'46.2" S 101o27'14.1" E	3.90 3.96 3.39	3.75
4	Sungai manau	1. 0o38'10.0" S 101o25'08,8" E 2. 0o37'51.3" S 101o25'15.6" E 3. 0o37'44.6" S 101o25'18.8" E	1.69 1.75 2.10	1.85
5	Muaro Tombang	1. 0o37'37.3" S 101o24'39.0" E 2. 0o37'35.4" S 101o24'41.5" E 3. 0o37'35.2" S 101o24'42.1" E	1.34 3.43 4.96	3.24
The average fresh biomass of kirinyuh weeds				2.56

Based on the results of the study in table 2, it can be seen that the average potential of kirinyuh weed biomass in Kuantan Singingi Regency is about 2.56 kg/m2. The biomass of kirinyuh weed in upstream Kuantan district is around 2.31-3.19 kg/m2. Kirinyuh weed biomass in Kuantan Mudik sub-district is around 1.40-3.75 kg/m2. If it is related between tables 3 and 4, it turns out that the location of kirinyuh weed grows affects its biomass. The lowest location of kirinyuh weed biomass was in Aurthorn Village, which was 1.40 kg and the highest was in Kinali Village, which was 3.75 kg. The low kirinyuh biomass in the village of Aur thorn is caused by kirinyuh weeds growing on the main road so that when the roadside is cleaned it interferes with the growth of kirinyuh. The greatest potential for kirinyuh

weed biomass is in Kinali Village because kirinyuh in this village grows on the banks of a river where the soil is fertile and water is available. Riverbank soil is sedimentary or alluvial soil with high soil fertility due to sedimentation during floods. According to Purnomo., et al (2013) river and reservoir water sediments contain organic matter which is a soil component that plays an important role in preserving soil fertility.

Hasriyanti, Abbas and Leo (2016)reported that alluvial soils were derived from alluvium parent soil, varied in texture, not yet formed in texture, consistency in sticky wet conditions, varied pH, moderate to high fertility. Alluvial soil only includes land that is frequently or recently flooded. Most alluvial soils along major streams are mixtures containing sufficient amounts of plant nutrients, so that they were generally considered fertile soils from the past.Haryanta, Thohiron and Gunawan (2017)added that alluvial soil has a solid soil structure and is classified as clay or sandy loam. From the chemical properties (nutrient content) and physical properties of the sedimentary soil, especially from the structure that is most likely to allow plants to grow well.

4.3 Nutrient contribution of kirinyuh weed in the sub-district of Kuantan district singingi

Based on the results of laboratory analysis, kirinyuh weed was able to contribute C-organic, N, P and K nutrients and had low C/N. The results of the analysis of kirinyuh weed nutrients can be seen in Table 3.

Table 3.The results of the analysis of the nutrient content of kirinyuh weeds that have the potential as green manure

Nutrient content	Unit	Hara on Stems	Nutrients on Leaves	Average stem + leaf nutrients
C-Organic	%	45.68	42.95	44.32
Organic Ingredients	%	78.75	74.05	76.40
Nitrogen (N)	%	1.82	4.41	3.12
C/N	-	25.09	9.74	17.41
Phosphorus (P)	%	1.16	1.03	1.10
Potassium (K)	%	4.56	3.06	3.81

Based on table 3, it can be seen that the C-organic content in kirinyuh weed and when converted to organic matter content is very high, namely in the stems around 45.68% C-organic equivalent to 78.75% organic matter, in leaves about 42.95% C-organic equivalent to 74.05 % organic matter. It can be seen in this study that the organic matter content of kirinyuh weed was almost the same between the stems and leaves.

The highest N nutrient content was found in the leaves of kirinyuh weed, namely 4.41% while in the stems it was about 1.82% N. The N content in the leaves of kirinyuh weed was very high and almost the same as the nutrient content of titonia green manure. Based on research results Gusnidar et al., (2011) titonia

contains N 0.95 1.55%; P 0.33 1.5%; and K 0.35 0.88%.

Based on the amount of N nutrient content in the stems and leaves, it is more advisable to use the leaves of kirinyuh weed as a source of N nutrients because the levels are higher. Table 5 also shows the C/N ratio in kirinyuh weeds, namely 25.09 on stems and 9.74 on leaves. The data explained that kirinyuh weed on the stems was rather hard and difficult to rot, while on the leaves it was very easy to rot because the C/N was lower than 10.Nugroho, Mildaryani and Candra Dewi (2019)states that the type of organic matter will affect the quality and quantity of organic matter. Kirinyuh weed has a C/N ratio of 19.52, which means it is below the critical C/N point, which is less than 30, so that weeds rot easily and quickly.

The nutrient content of P in kirinyuh stems and leaves was almost the same, namely 1.16% P in stems and 1.03% in leaves. While the content of K in the stem is about 4.56% and in the leaves 3.06. The nutrient content of P and K in kirinyuh weed is high and has the potential to contribute P and K nutrients to plants. According to(Asridawati and Febrianti, 2019)that phosphorus together with nitrogen and potassium are classified as the main elements in plants. Phosphorus functions in stimulating the formation of root hairs, fruit ripening and the formation of ATP (Adenosine Tri phosphate) energy. In addition to N and P, an important nutrient for plants is potassium. According toAfmerta, Ezward and Mashadi (2019)If K is not available in the soil, it can cause stunted plant development. Potassium is important in enzyme activity, assimilate translocation, and plays a role in increasing plant disease resistance and improving fruit quality (Kenzie, 2001).

Based on this research, kirinyuh weed in Kuantan Singingi district has the potential to be used as green manure because it produces a lot of biomass and contains high nutrients. The high potential of kirinyuh weed biomass in Kuantan singingi district is around 2.56 kg/m2 equivalent to 25.60 tons/ha, so if calculated the amount of nutrients in the stems and leaves of kirinyuh weed contains 3.12% N; 1.10%P; 3.81% K can contribute N nutrients around 798.72 kg N/Ha equivalent to 441.6 kg Urea, 281.60 kg P/Ha equivalent to 1,340 kg TSP/Ha and 975.36 kg K/Ha equivalent to 1,950 kg KCl/ Ha

Based on these nutrient calculations, kirinyuh weed can be used as an alternative to green manure in overcoming the current high price of artificial fertilizers in Kuantan singingi district. The ability of kirinyuh which is able to donate N equivalent to 441.6 kg Urea / Ha with the price of fertilizers both urea, SP36 and KCl Rp.8000/kg can save urea fertilization costs around Rp. 3,532,800/Ha, P kirinyuh equivalent to 1,340 kg TSP can save around Rp. 10,720,000 and K kirinyuh equivalent to 1,340 kg TSP can save KCl fertilizer costs of Rp. 15,600,000.

4. CONCLUSION

1. Weed kirinyuh in Kuantan singingi Regency has a distribution pattern of living in groups in various locations, namely riverbanks, roads, gardens, rice fields and shrubs.

2. Kirinyuh weed has the potential as green manure because it produces high biomass and contains high nutrients.
3. Kirinyuh weed in Kuantan singingi Regency has the potential to produce biomass around 2.31-3.19 kg/m2 with an average of 2.56 kg/m2 equivalent to 25.60 tons/ha.
4. Kirinyuh weed on the stem contributed 45.68% C-organic; 78.75% organic matter, 1.82% N; C/N of 25.09; 1.16% P and 4.56% K . the leaves are able to contribute nutrients 42.95% C-organic, 74.05% organic matter, 4.41% N; C/N of 9.74; 1.03% P and 3.06% K.

Suggestion

Based on this research, it is recommended to use kirinyuh weed which is widely spread in Kuantan singingi district as an alternative in situ green manure which can overcome the problem of the high cost of artificial fertilizers. and the high K is in the leaves. If you want to also use the stem, mix it with the soft stem

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