Nyale (*Eunicidae*) Flour Potential to Animal Trial *Rattus Norvegicus* Wistar Strain of Anemia

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ABSTRACT— ***Background: The cause of anemia often occur due to deficiency of nutrients. Marine worms "Nyale" Eunicidae contains rich in nutrients that is potential in the prevention and control of anemia. The purpose of this study was to determine the effect of flour marine worms "Nyale" from (Eunicidae) on levels of hemoglobin (Hb), red cell count, hematocrit value and the index of erythrocytes (MCV, MCH, MCHC) in rats (Rattus norvegicus) strain wistar who are anemic. Methods: using research laboratory experiment with a completely randomized design, used white mouse strain wistar as experimental animals with 5 treatments, negative control, positive control, provision of flour nyale 18 mg, 38 mg and 54 mg with a kind of observation hemoglobin levels, the number of erythrocytes, hematocrit value and erythrocyte indices MCV, MCH and MCHC. Result: indicates there is significant influence provision of flour "Nyale" on levels of hemoglobin, red cell count, hematocrit value, the index of erythrocyte MCV and MCHC in the blood of experimental animals anemic white rats and there is no effect of flour "Nyale" to the value of the index of erythrocyte MCH in the blood of white rats with anemia. Conclusion: flour nyale potential for the prevention of anemia in white rats.***

Keywords— *Nyale, marine worms, white rat, anemia*

1. INTRODUCTION

Nusa Tenggara Barat (NTB) is one of the provinces in Indonesia that is mostly ocean. The wealth of marine resources in NTB is a source of income, like farming of seaweed, pearl, lobster, and kerapau. Even one of the marine potential current source of tourism income Lombok Island is a "Bau Nyale" tradition. Bau Nyale is a Sasak tradition that living in South Lombok along the southern coast of the Lombok Island. Nyale included into *Polichaeta* class of *Annelid* phylum, genus *Eunicidae*. Polichaeta is a segmented worm that has a lot of hair (etymologically, *poly* meaning many; *chaeta* means similar structures hair) on his body. Polichaeta usually live at ocean with many coral reefs and attached to the sediments or attach to hard surfaces (benthic), while the larvae are planktonic (Pamungkas, 2009; Pamungkas 2011). This Nyale captured by Sasak to be consumed during swarming. The phenomenon is an event when the worms swarming sea of certain types gathered in abundance around the water surface for mating externally. Polichaeta to surface water at certain times (before the dawn of time until dawn). Bau Nyale Tradition held once a year and scheduled every January-June. This tradition of activities centered on two districts, namely in Central Lombok, precisely in the village of Kuta and Seger, and East Lombok, precisely in the Kaliantan Village and Jerowaru.

Swarming phenomenon occurs also in other eastern part of Indonesia, like Maluku and Sumba. In the territorial waters of Lombok Island, the types of sea worms is *Eunice siciliensis* and *Licydice collaris* with local designation "Nyale", in Maluku are *Lysidice Oele* and *Dendronereides heteropoda* with local designation Laor and in Sumba is *Eunice viridis* with local designation Palolo (Pamungkas, 2009; Pamungkas 2011).

Marine biota "Nyale" by sasak society used for cooking, in addition to baked goods can be roasted with mixed herbs such as garlic, onion and chili. People believe in consuming "Nyale" to nourish the body because they contain very high protein. Foodstuffs from the sea is rich in essential amino acids, fatty acids and minerals with high biological value.

Results from Dwi Soelistya Dyah Jekti research in 1999, shows that the levels of nutrients of Nyale are high, which contains protein 43.84%, fat 11.57%, carbohydrates 0.527%, phosphorus 1.17%, calcium 1.06%, magnesium 0.32%, sodium 1.69%, potassium 1.24%, 1.05 chloride% and 857 ppm iron. Latumahina MCA in 2011 shows the test results proximate nutrient content of marine worms *Lysidice oele* and *Dendronereides heteropoda* or worm Laor Water levels Maluku region is 81.51%, 13.92% protein, 1.01% fat, 2.41% Abu, Acid 1.265 amino Aspartate, Glutamate 1.63%, 0.38% serine, histidine 0.31%, 1.67% Glycine, Threonin 0.69%, 1.28% Arginine, Alanine 1.22%, 0.36 tyrosine %, Methionin 0.27%, 0.68% Valin, Phenilalanin 0.47%, isoleucine 0.68%, 1.08% Lysine, minerals, calcium (Ca) 636.86 ppm, 139.75 ppm Iodine, Vitamin C , B1, B6 and Vitamin B12 (Latumahina MCA, 20011). While Rosidi in 2012 shows the test results of proximate nutrient content of marine worms are cultivated is the fat content of 1.01 to 2.34%, from 6.37 to 6.45% Protein and Amino Acids from 3.14 to 3.79%.

Exploratory research potential of the marine worm "Nyale" is still lacking, although some research on Lombok Island to explore the potential of marine 'Nyale " has been carried out, among others, the results of research Dwi Sulistya Diah Jekti et al 1993 until 1996, succeeded in identifying marine worm species in the island is mainly the area of Central Lombok, precisely in the village of Kuta and Seger, and East Lombok, precisely in the Kaliantan Jerowaru Village. Species of marine worm found is *Eunice siciliensis* and *Licydice collaris*. Research results also prove that in *Eunice siciliensis* and *Licydice collaris* contains bioactive substances that are antimicrobial techniques thin layer chromatography resulted in four (substance), among four of these substances that contain bioactive compounds antimicrobial is a fraction No. 4 to the price of retardation factor (Rf) 0,05 against inhibition of the growth of *Proteus vulgaris*, *Escherichia coli*, *Streptococcus pyogenes* and *Helicobacter pylori* (Jekti, DSD et al, 1996). While the potential "Nyale" for the use of prevention and treatment of diseases of nutrient deficiency like anemia is unknown.

Kusmiati study in 2004 showed that the prevalence of iron deficiency anemia in Indonesia on each regions varies, between 38% - 71.5% with a mean of 63.5%. Based on the health profile NTB in 2007 the prevalence of nutritional anemia pregnant women 61.78% less anemia, anemia was 11.93% and 3.30% severe anemia, in Central Lombok regency 60.91% mild anemia, anemia was 6.84% and 9.98% severe anemia, whereas in East Lombok district 57.53% of mild anemia, anemia was 6.69% and 6.35% severe anemia.

Anemia is a condition of less blood and production erythrocyte is reduced characterized by levels hemoglobin and the number of red cells (erythrocytes) is lower than the normal value or a state of reduced levels of hemoglobin (Hb), hematocrit and red cell count is generally associated with iron deficiency in food or destruction erythrocytes fast (Sadikin M, 2001; Waterbury L, 2001). According to Sherwood, 2001 types of anemia wide - range depending on the cause, among other nutritional deficiency anemia (iron deficiency anemia, anemia defiensi vitamin C, folic acid deficiency anemia or vitamin B12), aplastic anemia, renal anemia, hemorrhagic anemia, hemolytic anemia.

The type of anemia that is experienced by many people is anemia due to nutritional deficiencies. Deficiencies that cause anemia as the main symptom is a lack of protein, iron and vitamin C are associated with the biosynthesis of hemoglobin (Hb). Proteins contained Nyale is as high as 43.84% are very helpful in the prevention of anemia, because protein is the main constituent component of hemoglobin and erythrocytes. Iron is part of the blood protein hemoglobin (Hb), which serves to carry oxygen from the lungs to all body cells. Iron deficiency anemia will cause the formation of erythrocytes with a small size (microcytic) and paler (hypochromic), so often referred to hypochromic anemia. The state of iron deficiency can be caused by iron intake through foods that are less, improper eating habits, lack of economic viability and infectious diseases. Iron can be obtained from animal and vegetable food sources. Iron comes from animal more easily utilized by the body than iron derived from vegetable, besides plant foods often contain organic compounds that inhibit the absorption of iron by binding iron. The content of iron and protein are high on nyale, lead can be used for the prevention and control of anemia.

Vitamin C deficiency can also cause anemia. Vitamin C has a role in the formation of hemoglobin in the blood, function of vitamin C helps the absorption of iron from food so that it can be processed into erythrocytes back, so if there is a deficiency of vitamin C, the amount of iron absorbed is reduced which causes the number of erythrocytes decreased and Hb decreased (Yusuf IS and Adelina, 2009). The content of vitamin C in nyale make nyale allegedly to prevent and cope with anemia.

Folic acid is a vitamin that are grouped in vitamin B. This vitamin has a role in the process of DNA synthesis is the process of methylation in the formation of purine and pyrimidine bases, the impact of folic acid deficiency experienced by cells that undergo rapid turnover, such as blood cells, especially erythrocytes in bone marrow and epithelial cells of the GI tract. Cells that are affected this will appear as the cells with a larger size so that the so-called macrocytic anemia. Deficiency of vitamin B12 because of the inability of the digestive tract to absorb vitamin B12 in the optimal amount can also cause anemia circumstances. Vitamin B12 deficiency usually occurs in Diphyllobothrium latum infestation of worms that live in the intestines. Vitamin B12 is needed in the process of maturation of erythrocytes, granulocytes and platelets, anemia called pernicious anemia. Deficient vitamin pyridoxine (B6) began to be considered as a cause of anemia (Sadikin M, 2001).

Common symptoms of anemia are pale, especially on the face, bearing nails, palms, mucous membranes mouth and conjunctiva resulting from reduced blood volume, reduced hemoglobin, and vasoconstriction to maximize the delivery of O_2 to the organs, fatigue, weakness, fatigue, lethargy, dizziness, decreased appetite, difficulty concentrating and forgetfulness, and often sick.

Severe anemia can lead to congestive heart failure due to cardiac muscle anoxia cannot adapt to the workload of the heart increased, and symptoms of disorders of the gastrointestinal tract such as anorexia, nausea, constipation or diarrhea, and stomatitis (pain in the tongue and mucous membranes mouth), a common symptom is caused by deficiency of iron is needed in the formation of hemoglobin. Hemoglobin (Hb) is a constituent of blood and an iron-containing porphyrin derivatives and function in terms of the binding and transport of O_2 and carry CO_2 from body tissues to the lungs for expulsion time breathing. Hemoglobin also helps regulate the balance of acids and bases in the blood (Budiyanto, 2002).

Prevention, mitigation and treatment of anemia, especially anemia due to malnutrition in the community need to get attention, especially people who live on the seashores are far from the health care center, one of which is to explore the potential of marine natural that can be used by communities around the coast, one of which is the potential of marine worms *Polichaeta* class of *Annelid* phylum, genus *Eunicidae* contained in the waters of Lombok Island.

This study will examine the effect of flour marine worms from "Nyale" (Eunicidae) on levels of hemoglobin (Hb), the number of erythrocytes, the index of erythrocytes (MCV, MCH, MCHC) and hematocrit in rats (*Rattus norvegicus*) strain wistar experience anemia. Back to nutrient content, especially protein, iron and vitamin C contained Nyale high enough, so that research results can be useful to society and relevant institutions as resources to be able to develop the cultivation of marine resources marine worms "Nyale" not only as a food ingredient that is only obtained one in a year, but can be made of food product packaging or pharmaceutical packaging which can be used at any time, especially for the prevention and treatment of anemia.

2. MATERIALS AND METHODS

This research is an experimental research in the laboratory with a research design using a completely randomized design (CRD). The independent variables: Flour marine worms "Nyale" dependent variable: hemoglobin, red cell count, erythrocyte indices (MCV, MCH, MCHC) and hematocrit. The population in this study were white rats. The sample in this study was the blood of white rats. The sample size in this study is determined based on the opinion Weill that the minimum sample for the use of experimental animals are 4 individuals and by a correction factor of 25% of the units of experiment, so in this study is used (5 x 4 = 20 white rats), a correction factor of 20 x 25% = 5 tail. Total experimental animals used were 20 fish + 5 = 25 tail tail. (Harmita & Infallible, 2008). Animals are placed in separate cages, each cage contains 5 rats, according to the division of treatment and correction factor. How purposive sampling with criteria of experimental animals are male rats, 3-4 months old, 200-250 grams weight with a healthy physical condition characterized by the general state of the body and physical activity are good. The inclusion criteria animal: Wistar strain male rats, aged 3-4 months, the body tightly 200-250 grams, healthy and active, normal hemoglobin concentration: 15-16 g%, erythrocyte levels: 7.2 -9.6 x 106 / mm3, Hematocrit: 45-47%. Exclusion criteria: Rats sick or die before the arrival time of observation. Ways of working:

2.1 Preparation and Acclimatization Rats (*Rattus Norvegicus)* Wistar Strain.

This study using rats (*Rattus norvegicus*) Wistar strain due to several reasons, among others, easily domesticated, easily maintained, easily enough blood drawn through the tail to get the blood capillaries, physiology estimated identical to humans (Harmita & Infallible 2008). Acclimatization animal for 7 days to water, food, air, and laboratory conditions. Feed given during acclimatization is standard feed rat (*Rattus norvegicus*) and Aquadest for drinking water.

2.2 Making flour marine worms "Nyale".

Fine powder marine worms "Nyale" obtained by drying the fresh nyale mix of males and females with drying temperatures below 40 ° C. Furthermore, preparations were made into a fine powder with a grinding machine, the result is a flour "Nyale".

2.3 Making Sodium Methyl Carboxi celulose (Na.CMC) 1% w / v.

Making Sodium Methyl Carboxi celulose (CMC) 1% w / v to ease flour and sea worms dissolve easily swallowed by the animal at the time penyondean prepared by Na. CMC weighed as much as 1 gram and then put into a mortar and crushed. Add 50 ml of hot water while crushed to form a colloidal solution. Then put in a glass beaker and added with distilled water to 100 ml.

2.4 The determination of an effective dose of flour marine worms "Nyale"

To determine the effective dose of flour marine worms "Nyale" as an alternative medicine prevention of anemia, used doses based on the results of the preliminary study that uses a dose of 1 gram, 2 grams and 3 grams for men and converted on white rats with the conversion value of 0.018 for mice with weight 200 grams, with the assumption that

human body weight 70 Kg (Harmita and infallible R, 2008). In this experiment, three dose represents the conversion of the dose in humans, namely:
Dosage 1: 1 gram x 0.018 = 0.0180 gram = 18 mg diluted in 10 ml of Sodium Methyl Carboxi celulose (CMC) 1% w / v, divided into 3 x administration per day at a distance of 2 hours, orally for 14 days.
Dose 2: 2 grams x 0.018 = 0.0360 gram = 36 mg diluted in 10 ml of Sodium Methyl Carboxi celulose (CMC) 1% w / v, divided into 3 x administration per day at a distance of 2 hours, orally for 14 days.
Dose 3: 3 grams x 0.018 = 0.0540 gram = 54 mg diluted in 10 ml of Sodium Methyl Carboxi celulose (CMC) 1% w / v, divided into 3 x administration per day at a distance of 2 hours, orally for 14 days.
Giving flour 'Nyale "according to the dosage is divided into 3 times the provision taking into account the volume of gastric animals tries to a maximum of 5 ml.

2.5 Creating the conditions Anemia in rats (*Rattus norvegicus*) Wistar strain

Creating the conditions Anemia in rats (*Rattus norvegicus*) strain Wistar in the manner Muchtadi (1989) in research Munawaroh S in 2009, namely: average of Sodium Nitrite ($NaNO_2$) orally in mice is 250 mg / kg body weight. Standard body weight of rats was 200 grams so LD_{50} for each head are:

$$LD_{50} = \frac{X\ mg}{200g} \times \frac{250mg}{100g}$$

$$= \frac{200g}{1000} \times 250$$

= 50 mg / head

LD_{50} effectively to make Anemia in mice as:

$$= \frac{1}{2} \times LD_{50}$$

$$= \frac{1}{2} \times 50\ mg$$

= 25 mg/ekor

So the maximum dose for the manufacture of Anemia condition in rats is 25 mg dissolved in 1 ml of distilled water. Giving the mice for 18 days. If the levels of hemoglobin, the red cell count and hematocrit values below the normal value, then the condition of experimental animals are already experiencing anemia.

2.6 How to manufacture doses Ferriz

Each ml Ferriz feredetate contains 115.4 mg sodium equivalent to 15 mg of iron element. Rules: Childrens aged 1-2 years 0.8 ml once daily. Each 1 ml contains 15 mg of iron element, so Ferriz 0.8 ml syrup contains 12 mg = 0.012 grams of the element iron. Normal weight children aged 1 year and 9 kg = 9000 grams. So Ferriz syrup doses in mice with a standard 200 grams weight is:
Dosage administration:

$$\frac{\text{Standard body weight of rats}}{\text{The weight of the child 1 year}} \text{x } 12 \text{ mg}$$

$$\frac{200\ grams}{9000\ grams} \text{x } 0{,}012 \text{ grams} = 0{,}00027 \text{ grams} = 0{,}27 \text{ mg}$$

For Ferriz dosage 12 mg / 0.8 ml:

$$\frac{0{,}26}{12\ mg\ /0{,}8\ ml} = \frac{0{,}26}{12\ mg} \text{ x } 0{,}8 \text{ ml} = 0{,}017 \text{ ml}$$

2.7 The division of experimental animals by treatment group and factors correction.

Rats (*Rattus norvegicus*) Wistar strain that has experienced anemic put it in a cage in accordance with the treatment group. The number of experimental animals used per treatment in accordance with the opinion of Weill are 4 individuals and plus each 1 tail for a correction factor, so that each treatment using 5 animals try. The details of the treatment groups of experimental animals are :
G1: Group I (negative control) made anemic condition (giving $NaNO_2$ 1 ml / rat / day according to the dosage and the body weight of rats for 18 days) + standard feed 12 grams / day + Aquadest in ad labitium for 14 days.

G2: Group 2 (positive control) made anemic condition (giving $NaNO_2$ 1 ml / rat / day according to the dosage and the body weight of rats for 18 days) + feed standard 12 grams / day + Aquadest in ad labitium + Ferriz according to the weight of white rats during 14 days.
G3: Group 3 (treated 18 mg) was made anemic condition (giving $NaNO_2$ 1 ml / rat / day according to the dosage and the body weight of rats for 18 days) + Flour marine worms "nyale" dose of 18 mg / head / day for 14 days + feed standard 12 grams / day + Aquadest an ad labitium.
G4: Group 4 (treatment 36 mg) creating the conditions anemia (Award $NaNO_2$ 1 ml / rat / day according to the dosage and the body weight of rats for 18 days) + Flour marine worms "nyale" dose of 36 mg / head / day for 14 days + feed standard 12 grams / day + Aquadest an ad labitium.
G5: Group 5 (treatment 54 mg) creating the conditions anemia (Award $NaNO_2$ 1 ml / rat / day according to the dosage and the body weight of rats for 18 days) + Flour marine worms "nyale" dose of 54 mg / head / day for 14 days + feed standard 12 grams / day + Aquadest an ad labitium.
(Determination nyale dosage and frequency of administration based on preliminary testing, while the base duration of administration and manufacturing conditions of anemia based on research Munawaroh S 2009).

2.8 Blood sampling for checking levels of hemoglobin, red cell count, hematocrit and red cell indices before and after the anemic condition.

Each animal grouped by treatment group blood taken via tail vein and for checking the levels of hemoglobin, red cell count, hematocrit and index of erythrocyte MCV, MCH and MCHC before, after the anemic condition and after treatment using a Sysmex Pentra XL 80, Cell DYN Emerald Call DYN 3200. the working principle of a routine examination using a Sysmex Hematology Pentra XL 80, Cell DYN Emerald Call DYN 3200 is a mixed blood samples EDTA anticoagulant test tube, and then the blood is inserted into the needle probe tool, the tool will work reading routine hematology parameters with push button switch, Tools and print to print the results. For the data of the index value erythrocyte MCV, MCH and MCHC can be corrected by using the formula:

MCV (Mean corpuscular volume) adalah volume rata-rata sebuah eritrosit (femtoliter)

$$MCV = \frac{10 \times \text{Hematokrit (\%)}}{\text{Eritrosit (jt/ul)}}$$

MCH (Mean corpuscular Hemoglobin) adalah banyaknya Hemoglobin per eritrosit (pikogram)

$$MCH = \frac{10 \times \text{Hemoglobin (g/dl)}}{\text{Eritrosit (jt/ul)}}$$

MCHC (Mean Corpuscular Hemoglobin Concentration) adalah Kadar hemoglobin yang didapat per eritrosit (%)

$$MCHC = \frac{100 \times \text{Hemoglobin (g/dl)}}{\text{Hematokrit (\%)}}$$

Data analysis.
Data from the calculation of levels of hemoglobin, red cell count, hematocrit and red cell indices in group G1, G2, G3, G4, and G5 analyzed using One Way ANOVA statistical test at the confidence level 95% ($P\alpha = 0,05$). Statistical tests performed with SPSS.

3. RESULTS

Data from the weighing, checking the levels of hemoglobin, red cell count, hematocrit value and the index value of erythrocytes MCV, MCH and MCHC before the condition of anemia in 25 white rats, with the examination of hematology routine using a Sysmex Pentra XL 80, Cell DYN Emerald Call DYN 3200 can be seen in table 1.

Table 1. Data weight, hemoglobin levels, red cell count, hematocrit value and erythrocyte index value MCV, MCH and MCHC before anemic condition rats (*Rattus norvegicus*) Wistar strain.

No	Animal Code	Weight (grams)	Hb Level (g/dl)	Erythochytes (million/ul)	Hematocrit Value (%)	MCV (fl)	MCH (pg)	MCHC (g/dl)
1.	G1a	210	15.70	7.47	44.90	60.10	21.00	34.96
2.	G1b	230	15.00	7.16	43.60	60.89	20.94	34.40
3.	G1c	213	15.10	7.87	45.40	57.68	19.18	33.25
4.	G1d	210	15.70	7.42	44.80	60.37	21.15	35.04
5.	G1e	235	15.90	7.40	45.30	61.21	20.10	35.09
6.	G2a	240	15.00	7.15	45.80	64.05	20.97	32.75
7.	G2b	240	15.90	7.80	45.70	58.58	19.04	34.79
8.	G2c	235	14.80	7.28	45.80	62.91	20.32	32.31
9.	G2d	220	15.10	7.28	46.00	63.18	20.74	32.82
10.	G2e	225	15.90	7.87	45.30	57.56	20.20	35.09
11.	G3a	245	15.60	7.89	45.90	58.17	19.77	33.98
12.	G3b	240	15.30	8.00	46.30	57.87	19.12	33.04
13.	G3c	250	14.70	7.54	44.80	59.41	19.49	32.80
14.	G3d	240	15.00	7.90	44.20	55.94	18.98	33.93
15.	G3e	245	15.20	7.20	44.80	62.20	21.11	33.92
16.	G4a	230	15.60	7.80	45.40	58.20	20.00	34.36
17.	G4b	220	15.00	7.00	44.60	63.71	21.42	33.63
18.	G4c	225	15.00	7.20	45.40	63.05	20.83	33.03
19.	G4d	230	15.40	7.18	46.20	64.34	21.44	33.33
20.	G4e	230	15.00	7.80	44.20	56.67	19.23	33.93
21.	G5a	235	15.80	7.80	45.80	58.71	20.25	34.49
22.	G5b	238	15.60	7.82	45.30	57.92	19.94	34.43
23.	G5c	236	15.20	7.00	46.20	66.00	21.71	32.90
24.	G5d	230	15.00	7.20	44.60	61.94	20.83	33.63
25.	G5e	245	15.60	7.78	45.20	58.09	20.05	34.51
	Total	**5797**	**383.1**	**187.81**	**1131.5**	**1508.75**	**507.21**	**846.41**
	Average	**231.88**	**15.324**	**7.51**	**45.26**	**60.35**	**20.29**	**33.86**

Data from the weighing, checking the levels of hemoglobin, red cell count, hematocrit, erythrocytes index value MCV, MCH and MCHC on 25 head of white rats induced $NaNO_2$ for 18 days to make the anemic condition can be seen in Table 2.

Table 2. Data weight, hemoglobin levels, red cell count, hematocrit value and erythrocyte index value MCV, MCH

and MCHC on rats (*Rattus norvegicus*) Wistar strain after induced $NaNO_2$ (Anemia condition).

No	Animal Code	Weight (grams)	Hb Level (g/dl)	Erythochytes (million/ul)	Hematocrit Value (%)	MCV (fl)	MCH (pg)	MCHC (g/dl)
1.	G1a	205	12.40	6.20	37.00	59.67	20.00	33.51
2.	G1b	224	12.90	6.23	38.90	62.43	20.70	33.16
3.	G1c	210	12.60	6.00	38.00	63.33	21.00	33.15
4.	G1d	209	12.49	6.29	37.20	62.32	19.71	31.63
5.	G1e	232	13.20	6.34	38.20	60.25	20.82	34.55
6.	G2a	238	12.00	6.32	36.80	58.22	18.98	32.60
7.	G2b	237	13.00	6.58	37.20	56.53	19.75	34.94
8.	G2c	233	12.62	6.48	37.80	58.33	19.44	33.33
9.	G2d	218	12.60	6.24	37.40	59.93	20.19	33.68
10.	G2e	221	12.60	6.50	37.80	58.15	19.38	33.33
11.	G3a	240	12.00	6.40	35.70	55.78	18.75	34.61
12.	G3b	238	12.30	8.00	46.30	57.87	19.12	33.04
13.	G3c	247	12.70	7.54	44.80	59.41	19.49	32.80
14.	G3d	237	12.20	6.49	37.00	57.00	18/.79	32.97
15.	G3e	242	12.40	6.30	36.00	57.14	18.23	34.44
16.	G4a	228	12.40	6.24	35.60	54.60	19.00	34.83
17.	G4b	215	12.40	6.32	36.80	58.22	19.62	33.69
18.	G4c	221	12.00	5.92	34.40	58.10	20.27	34.88
19.	G4d	226	12.20	6.33	35.80	56.55	19.27	34.07
20.	G4e	227	12.30	6.26	37.00	59.10	19.64	33.24
21.	G5a	230	12.20	5.94	34.60	58.24	20.53	35.26
22.	G5b	232	12.40	6.22	35.60	57.23	19.93	34.83
23.	G5c	232	12.40	6.24	36.40	58.33	19.87	34.06
24.	G5d	228	12.00	5.96	35.20	59.06	20.13	34.09
25.	G5e	239	12.20	6.23	35.90	57.62	19.58	33.98
Total		**5709**	**315.51**	**159.57**	**9334**	**1463.41**	**492.19**	**844.67**
Average		**228.36**	**12.62**	**6.38**	**37.34**	**58.51**	**19.67**	**33.77**

Data from the weighing, checking the levels of hemoglobin, red cell count, hematocrit value and erythrocyte index value MCV, MCH and MCHC after treatment can be seen in Table 3.

Table 3. Data of weight, hemoglobin levels, red cell count, hematocrit value and erythrocyte index value MCV, MCH and MCHC after treatment in rats (*Rattus norvegicus*) Wistar strain.

Group Treatment	Weight (grams)	Hb level (g/dl)	Erytochyites Amount (million/ul)	Hematocrit Value (%)	MCV (fl)	MCH (pg)	MCHC (g/dl)
G1	206	12.60	6.40	38.00	59.37	19.68	33.15
	226	13.00	6.30	39.00	61.90	20.63	33.33
	210	12.80	6.20	38.20	61.61	20.64	33.50
	210	12.50	6.32	37.80	59.81	19.77	33.06
	234	13.20	6.60	38.60	58.48	20.00	34.19
Total	**1086**	**64.10**	**31.82**	**191.60**	**301.17**	**100.72**	**167.23**
Average	**217.20**	**12.82**	**6.36**	**38.32**	**60.23**	**20.14**	**33.46**
G2	239	16.60	8.22	51.00	62.04	20.19	32.54
	241	16.40	8.42	52.00	61.75	19.47	31.54
	234	16.80	8.25	50.30	60.96	20.36	33.39
	218	16.40	8.22	50.10	60.94	19.95	32.73
	222	17.00	8.92	56.00	62.78	19.05	30.35
Total	**1154**	**83.20**	**42.03**	**259.00**	**308.47**	**99.02**	**160.55**
Average	**230.80**	**16.64**	**8.41**	**51.88**	**61.69**	**19.80**	**32.11**
G3	244	15.80	7.94	46.60	58.69	19.89	33.90
	242	15.80	8.20	46.80	57.05	19.26	33.76
	249	15.00	7.82	47.00	60.10	19.18	31.91
	243	15.80	8.00	46.80	58.50	19.75	33.76
	247	15.60	7.80	46.00	58.97	20.00	33.90
Total	**1225**	**78.00**	**39.76**	**233.2**	**293.31**	**98.08**	**167.23**
Average	**245**	**15.60**	**7.95**	**46.64**	**58.66**	**19.61**	**33.46**
G4	234	17.00	8.48	52.80	62.26	20.04	32.19
	228	16.80	8.30	52.60	63.37	20.24	31.93
	227	16.80	8.51	53.20	62.51	19.74	31.57
	234	16.90	8.62	52.80	60.25	19.60	32.01
	236	17.00	8.64	52.80	61.11	19.67	32.19
Total	**1159**	**84.50**	**42.55**	**264.20**	**309.50**	**99.29**	**159.89**
Average	**231.80**	**16.90**	**8.51**	**52.84**	**61.90**	**19.86**	**31.98**
G5	239	17.00	8.52	55.40	65.02	19.95	30.68
	240	17.00	8.68	53.60	61.75	19.58	31.71
	240	16.90	8.64	54.00	62.50	19.56	31.29
	236	17.00	8.68	52.80	61.82	19.58	32.19
	247	17.00	8.72	53.20	61.01	19.49	31.95
Total	**1202**	**84.90**	**43.24**	**269.00**	**312.10**	**98.16**	**157.82**
Average	**240.4**	**16.98**	**8.65**	**53.80**	**62.42**	**19.63**	**31.56**

Information :

G1: Group I (negative control) made anemic condition (giving $NaNO_2$ 1 ml / rat / day according to the dosage and the body weight of rats for 18 days) + standard feed 12 grams / day + Aquadest an ad labitium.

G2: Group 2 (positive control) made anemic condition (giving $NaNO_2$ 1 ml / rat / day according to dosage and the body weight of rats for 18 days) + standard feed 12 grams / day + Aquadest in ad labitium + Ferriz.

G3: Group 3 (treated 18 mg) was made anemic condition (giving $NaNO_2$ 1 ml / rat / day according to the dosage and the body weight of rats for 18 days) + Flour marine worms "Nyale" dose of 18 mg / head / day for 14 days + feed standard 12 grams / day + Aquadest an ad labitium.

G4: Group 4 (treatment 36 mg) creating the conditions anemia (Award $NaNO_2$ 1 ml / rat / day according to the dosage and the body weight of rats for 18 days) + Flour marine worms "Nyale" dose of 36 mg / head / day for 14 days + feed standard 12 grams / day + Aquadest an ad labitium.

G5: Group 5 (treatment 54 mg) creating the conditions anemia (Award $NaNO_2$ 1 ml / rat / day according to the dosage and the body weight of rats for 18 days) + Flour marine worms "nyale" dose of 54 mg / head / day for 14 days + feed standard 12 grams / day + Aquadest an ad labitium.

Data difference between the results of hemoglobin levels, red cell count, hematocrit value and erythrocyte index value MCV, MCH and MCHC in anemia condition (before treatment) and after treatment administration of flour "Nyale" can be seen in Table 4 and 5.

Table 4. Data hemoglobin levels, the number of erythrocytes and hematocrit values before and after administration of flour "Nyale" in rats (*Rattus norvegicus*) Wistar strain.

Group Treatment	Hb level (g/dl)			Erytochyites Amount (million/ul)			Hematocrit Value (%)		
	1	2	3	1	2	3	1	2	3
G1	12.40	12.60	0.20	6.20	6.40	0.20	37.00	38.00	1.00
	12.90	13.00	0.10	6.23	6.30	0.07	38.90	39.00	0.10
	12.60	12.80	0.20	6.00	6.20	0.20	38.00	38.20	0.20
	12.49	12.50	0.01	6.29	6.32	0.03	37.20	37.80	0.60
	13.20	13.20	0.00	6.34	6.60	0.26	38.20	38.60	0.40
Total	**63.59**	**64.10**	**2.31**	**31.06**	**31.82**	**0.76**	**189.30**	**191.60**	**2.30**
Average	**12.72**	**12.82**	**0.10**	**6.21**	**6.36**	**0.15**	**37.86**	**38.32**	**0.46**
G2	12.00	16.60	4.60	6.32	8.22	1.90	36.80	51.00	14.20
	13.00	16.40	3.40	6.58	8.42	1.84	37.20	52.00	14.80
	12.62	16.80	4.18	6.48	8.25	1.77	37.80	50.30	12.50
	12.60	16.40	3.80	6.24	8.22	1.98	37.40	50.10	12.70
	12.60	17.00	4.40	6.50	8.92	2.42	37.80	56.00	18.20
Total	**62.82**	**83.20**	**20.38**	**32.12**	**42.03**	**9.91**	**187.00**	**259.00**	**72.40**
Average	**12.56**	**16.64**	**4.08**	**6.42**	**8.41**	**1.98**	**37.40**	**51.88**	**14.48**
G3	12.00	15.80	3.80	6.40	7.94	1.54	35.70	46.60	10.90
	12.30	15.80	3.50	8.00	8.20	0.20	46.30	46.80	0.50
	12.70	15.00	2.30	7.54	7.82	0.28	44.80	47.00	2.20
	12.20	15.80	3.60	6.49	8.00	1.51	37.00	46.80	9.80
	12.40	15.60	3.20	6.30	7.80	1.50	36.00	46.00	10.00
Total	**61.60**	**78.00**	**16.40**	**34.73**	**39.76**	**5.03**	**199.8**	**233.2**	**33.40**
Average	**12.32**	**15.60**	**3.28**	**6.95**	**7.95**	**1.01**	**39.96**	**46.64**	**6.68**
G4	12.40	17.00	4.60	6.24	8.48	2.24	35.60	52.80	17.20
	12.40	16.80	4.40	6.32	8.30	1.98	36.80	52.60	15.80
	12.00	16.80	4.80	5.92	8.51	2.59	34.40	53.20	18.80
	12.20	16.90	4.70	6.33	8.62	2.29	35.80	52.80	17.00
	12.30	17.00	4.70	6.26	8.64	2.38	37.00	52.80	15.80
Total	**61.30**	**84.50**	**23.20**	**31.07**	**42.55**	**11.48**	**179.60**	**264.20**	**84.60**
Average	**12.26**	**16.90**	**4.64**	**6.21**	**8.51**	**2.29**	**35.92**	**52.84**	**16.92**
G5	12.20	17.00	4.80	5.94	8.52	2.58	34.60	55.40	20.80
	12.40	17.00	4.60	6.22	8.68	2.46	35.60	53.60	18.00
	12.40	16.90	4.50	6.24	8.64	2.40	36.40	54.00	17.60
	12.00	17.00	5.00	5.96	8.68	2.72	35.20	52.80	17.60
	12.20	17.00	4.80	6.23	8.72	2.49	35.90	53.20	17.30
Total	**61.20**	**84.90**	**23.70**	**30.59**	**43.24**	**12.65**	**177.7**	**269.00**	**91.30**
Average	**12.24**	**16.98**	**4.74**	**6.12**	**8.65**	**2.53**	**35.54**	**53.80**	**18.26**

Table 5. Data index values erythrocyte MCV, MCH and MCHC before and after administration of flour "Nyale" in rats (*Rattus norvegicus*) Wistar strain.

Group Treatment	Index MCV (fl)			Erythrocyte indices MCH (pg)			erythrocyte indices MCHC (g/dl) (%)		
	1	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
G1	60.10	59.37	-0.73	21.00	19.68	-1.32	34.96	33.15	-1.81
	60.89	61.90	1.01	20.94	20.63	-0.31	34.40	33.33	-1.07
	57.68	61.61	3.93	19.18	20.64	1.46	33.25	33.50	0.25
	60.37	59.81	-0.56	21.15	19.77	-1.38	35.04	33.06	-1.98
	61.21	58.48	-2.73	20.10	20.00	-0.10	35.09	34.19	-0.90
Total	**300.25**	**301.17**	**0.92**	**102.37**	**100.72**	**-1.65**	**172.74**	**167.23**	**-5.51**
Average	**60.05**	**60.23**	**0.18**	**20.47**	**20.14**	**-0.33**	**34.55**	**33.46**	**-1.09**
G2	64.05	62.04	-2.01	20.97	20.19	-0.78	32.75	32.54	-0.21
	58.58	61.75	3.17	19.04	19.47	0.43	34.79	31.54	-3.25
	62.91	60.96	-1.95	20.32	20.36	0.04	32.31	33.39	1.08
	63.18	60.94	-2.24	20.74	19.95	-0.79	32.82	32.73	-0.09
	57.56	62.78	5.22	20.20	19.05	-1.15	35.09	30.35	-4.74
Total	**306.28**	**308.47**	**2.19**	**101.27**	**99.02**	**-2.25**	**167.76**	**160.55**	**-7.21**
Average	**61.26**	**61.69**	**0.43**	**20.25**	**19.80**	**-0.45**	**33.55**	**32.11**	**-1.44**
G3	58.17	58.69	0.52	19.77	19.89	0.12	33.98	33.90	-0.08
	57.87	57.05	-0.82	19.12	19.26	0.14	33.04	33.76	0.72
	59.41	60.10	0.69	19.49	19.18	-0.31	32.80	31.91	-0.89
	55.94	58.50	2.56	18.98	19.75	0.77	33.93	33.76	-0.17
	62.20	58.97	-3.23	21.11	20.00	-1.11	33.92	33.90	-0.02
Total	**293.59**	**293.31**	**-0.28**	**98.47**	**98.08**	**-0.39**	**167.67**	**167.23**	**-0.44**
Average	**58.72**	**58.66**	**-0.06**	**19.69**	**19.61**	**-0.08**	**33.53**	**33.46**	**-0.07**
G4	58.20	62.26	4.06	20.00	20.04	0.04	34.36	32.19	-2.17
	63.71	63.37	-0.34	21.42	20.24	-1.18	33.63	31.93	-1.70
	63.05	62.51	-0.54	20.83	19.74	-1.09	33.03	31.57	-1.46
	64.34	60.25	-4.09	21.44	19.60	-1.84	33.33	32.01	-1.32
	56.67	61.11	4.44	19.23	19.67	0.44	33.93	32.19	-1.74
Total	**305.97**	**309.50**	**3.53**	**102.92**	**99.29**	**-3.63**	**168.28**	**159.89**	**-8.38**
Average	**61.19**	**61.90**	**0.71**	**20.58**	**19.86**	**-0.72**	**33.66**	**31.98**	**-1.68**
G5	58.71	65.02	6.32	20.25	19.95	-0.30	34.49	30.68	-3.81
	57.92	61.75	3.83	19.94	19.58	-0.36	34.43	31.71	-2.72
	66.00	62.50	-3.50	21.71	19.56	-2.15	32.90	31.29	-1.61
	61.94	61.82	-0.12	20.83	19.58	-1.25	33.63	32.19	-1.44
	58.09	61.01	2.92	20.05	19.49	-0.56	34.51	31.95	-2.56
Total	**302.66**	**312.10**	**9.44**	**102.78**	**98.16**	**-4.62**	**169.96**	**157.82**	**12.14**
Average	**60.53**	**62.42**	**1.89**	**20.56**	**19.63**	**-0.93**	**33.99**	**31.56**	**-2.43**

Information :
G1: Group I (negative control) made anemic condition (giving $NaNO_2$ 1 ml / rat / day according to the dosage and the body weight of rats for 18 days) + standard feed 12 grams / day + Aquadest an ad labitium.
G2: Group 2 (positive control) made anemic condition (giving $NaNO_2$ 1 ml / rat / day according to the dosage and the body weight of rats for 18 days) + standard feed 12 grams / day + Aquadest in ad labitium + Ferriz.
G3: Group 3 (treated 18 mg) was made anemic condition (giving $NaNO_2$ 1 ml / rat / day according to the dosage and the body weight of rats for 18 days) + Flour marine worms "Nyale" dose of 18 mg / head / day for 14 days + feed standard 12 grams / day + Aquadest an ad labitium.
G4: Group 4 (treatment 36 mg) creating the conditions anemia (Award $NaNO_2$ 1 ml / rat / day according to the dosage and the body weight of rats for 18 days) + Flour marine worms "nyale" dose of 36 mg / head / day for 14 days + feed standard 12 grams / day + Aquadest an ad labitium.
G5: Group 5 (treatment 54 mg) creating the conditions anemia (Award $NaNO_2$ 1 ml / rat / day according to the dosage and the body weight of rats for 18 days) + Flour marine worms "Nyale" dose of 54 mg / head / day for 14 days + feed standard 12 grams / day + Aquadest an ad labitium.
1: Conditions Anemia

2: After the treatment Provision of flour "Nyale"
3: The difference results before and after treatment

Table 4 shows the increased levels of hemoglobin, the red cell count and hematocrit values in all treatment groups. One Way Anova test results to see the effect of flour "Nyale" on levels of hemoglobin, the red cell count and hematocrit values of white rats Wistar strain with anemia showed the p-value (0.000) <α0.05 prove that Ho was rejected and Ha acceptable which means there is the effect of flour "Nyale" on levels of hemoglobin, number of erythrocytes and blood hematocrit values of white rats wistar strain with anemia. Results of further tests comparing multiple Tukey HSD to know the influence of flour "Nyale" on levels of hemoglobin, the red cell count and hematocrit value of each treatment shows that the negative control (G1), a positive control (G2), the provision of flour "Nyale" 18 mg (G3), the provision of flour "Nyale" 36 mg (G4) and the provision of flour "Nyale" 54 mg showed a value of p <α 0.05 prove there are significant or significant difference in hemoglobin levels, the number of erythrocytes and hematocrit values between negative control treatment group the other, while the positive control group (G2) with G4 and G5 group demonstrated the value of p> α 0.05 prove hemoglobin levels, the number of erythrocytes and hematocrit values between the treatment groups there is no influence / no significant differences.

4. DISCUSSION

White rats used in this study were 25 animals that are physically healthy and overview criteria for blood examination of experimental animals do not have anemia. Criteria for the normal value of a picture of a blood test white rats normal hemoglobin level of 15-16 g / dl, the red cell count 7.2 - 9.6 million / ul, hematocrit 45-47%, blood volume 57-70 ml / kg bw, the index value of erythrocytes MCV 60 fl - 99 fl, MCH index value of 20 - 31pg and MCHC index value of 33-37 g / dl (Back, 1987). Table 3.1. shows image data results of blood tests rats of white to be used in research, the results of the mean of hemoglobin (15 324 g / dl), the number of erythrocytes (7.51 million / ul) and hematocrit value (45.26%) indicates the condition of the experimental animals did not happen anemia, although the analysis of table 3.1 shows that the experimental animals No. 8 in hemoglobin levels slightly below normal (14.80 g / dl), No. 13 levels of hemoglobin 14.70 g / dL and a hematocrit value of 44.80%, no experimental animals 2,6, and 19, the number of erythrocytes decreased slightly and animal no 1,2,4,13,14,15,17,20 and 24 slightly decreased hematocrit values, but the animal did not happen because the criteria for anemia anemia of each - each animal were not met and that the levels of hemoglobin, the number of erythrocytes and hematocrit fall all.

Anemia is a condition of being blood and erythrocyte production is reduced characterized by hemoglobin levels and the number of red cells (erythrocytes) is lower than the normal value or a state of reduced levels of hemoglobin (Hb), hematocrit and red cell count is generally associated with iron deficiency in food or destruction erythrocytes quickly. Anemia will cause the body to experience hypoxia as a result of the ability of oxygen-carrying capacity of blood is reduced (Sadikin M, 2001; Waterbury L, 2001).

Hemoglobin is a combination of heme and globin, with a molecular weight of 67,000 Kd. The formation of hemoglobin occurs in normoblast where four heme groups are combined into one molecule globin. Hemoglobin is a complex protein - pigment containing iron are red in color and contained in the erythrocytes. A hemoglobin molecule has four heme groups containing ferrous iron and the four globin chains. Hemoglobin has an affinity for oxygen and oxygen to form oxihemoglobin in erythrocytes and carries oxygen from the lungs to the tissues of the body, transporting CO_2 from all the tissues to the lungs for expulsion from the body and determine the buffer capacity of the blood. The synthesis of hemoglobin is a biochemical process involving several nutrients, especially in the synthesis of heme and globin, such as the amino acid glycine, the globin protein, iron, and vitamin B. whereas the globin protein necessary for the synthesis of amino acids, biotin, folic acid, vitamin B6 and vitamin B12. (Evelyn P, 2008).

Erythrocytes are nucleated cells, consisting of erythrocyte membrane or plasmalemma composed of 40% lipids (phospholipids, cholesterol, glycolipids), 50% protein and 10% carbohydrates. The inside of the erythrocyte-containing systems glycolytic enzymes that play a role in producing energy, the enzyme carbonic anhydrase which plays a role in the transport of carbon dioxide and 33% hemoglobin. The main function of erythrocytes transporting hemoglobin, which carries oxygen from the lungs to the tissues, catalyzes the reaction between carbon dioxide and water, maintain hemoglobin in a state of reduced (ferrous) and to maintain osmotic balance, activity in generating energy as Adenosine triphosphate (ATP) and generating reducing the power as NADH through anaerobic glycolysis, and NADPH through the shortcut path hexose monophosphate (Hoffbrand et al, 2002). Erythrocytes in white rats have the number varies between 7.2 - 9.6- 10 million / ul, biconcave disk shape, circular and the diameter of 6.2 - 6.4 microns. Long live white rat erythrocytes in 45-50 days (Widjajakusuma and Sikar, 1986). The rate of formation of erythrocytes controlled in accordance with the needs of the body. If the content of oxygen in body tissues decreases, the kidneys will produce and release the hormone erythropoietin that stimulates the bone marrow to form more red cells. Erythrocyte production rate of approximately 2 million / sec.

Hematocrit (HCT) or solid cell volume, indicating a complete blood volume that consists of erythrocytes. Measurement HCT is porsentase erythrocytes in the blood of a blood specimen in centrifuges and expressed in mm^3 dense cells / 100 ml of blood, or in the volume / 100 ml (Sylvia A.P and Lorraine M.W, 1994).

The condition of anemia in this study to obtain hemoglobin levels, the number of erythrocytes and hematocrit values below the normal values in rats do $NaN0_2$ administration at 25 mg dissolved in 1 ml of distilled water. Giving the mice for 18 days. Yuningsih (2000) in Munawaroh, 2009 states that $NaNO_2$ in the body affects the transport of oxygen by hemoglobin. Nitrite will change the iron Fe^{2+} to Fe^{3+} so that the process of oxygen transport will be disrupted and even function, so the hemoglobin can not carry oxygen to tissues. Changes valence heme iron from ferrous into ferric oxidation of nitrite into methemoglobin compounds which function as transporters of oxygen. Methemoglobin is hematin-globin containing Fe3 + OH. If this condition lasts continuously can cause anemia. Anemia is the condition of the 25 animals of experimental animals after induction $NaNO_2$ shows the condition of anemia due to hemoglobin levels, the number of erythrocytes and hematocrit values fell all. The mean hemoglobin level of 12.62 g / dl, the mean number of erythrocytes 6.38 million / ul and a mean value of 37.34% hematocrit values. The decline also occurred in the index value erythrocytes MCV, MCH and MCHC. Analysis Table 3.2 in experimental animals were conditioned anemia, animal no 2,3,4,10,14 and 20 after induction $NaNO_2$ show MCV values increase, it is likely due to iron reserves in the form of ferritin in the mice before $NaNO_2$ induced higher compared to mice try another. The weakness of this study does not foresee ferritin levels of each rat, because it is not measured in this study.

This type of anemia wide - range depending on the cause, among other things anemia deficiency of nutrients (iron deficiency anemia, anemia defiensi vitamin C, anemia deficiency of folic acid or vitamin B12), aplastic anemia, renal anemia, anemia hemorrhagic, hemolytic anemia (Sherwood, 2001).

This type of anemia experienced by many people is anemia due to nutritional deficiencies. Deficiencies that cause anemia as the main symptom is a lack of protein, iron, vitamin C, vitamin B12, folic acid, pyridoxine, cu related to the biosynthesis of hemoglobin (Hb). Therefor in this study examined marine natural food of high nutritional content to prevent and treat conditions such as anemia flour "Nyale".

The research proves that the administration of flour "Nyale" can increase the levels of hemoglobin, the red cell count and hematocrit values in experimental animals with anemia. On the negative control group (G1) increase in mean hemoglobin levels 0.10 g / dl, the number of erythrocytes 0.15 million / ul, 00.46% hematocrit values. This increase disebakan because of the negative control group, although not given flour "Nyale" but still be given the standard feed containing protein and carbohydrates, although the increase is not as high as in the group G2, G3, G4 and G5. The positive control group (G2) increase in mean hemoglobin levels 4.08 g / dl, the red cell count is 1.98 million / ul, 14.48% hematocrit values. The treatment group were given flour marine worms "Nyale" dose of 18 mg / head / day for 14 days + feed standard 12 grams / day + Aquadest in ad labitium (G3) an increase in levels of hemoglobin average of 3.28 g / dl, the number of erythrocytes 1.01 million / ul, hematocrit value of 6.68%. In the treatment group were given flour marine worms "Nyale" dose of 36 mg / head / day for 14 days + feed standard 12 grams / day + Aquadest in ad labitium (G4) an increase in levels of hemoglobin average of 4.64 g / dl, the number of erythrocytes 2.29 million / ul, hematocrit value of 16.92%. The treatment group were given flour marine worms "nyale" dose of 54 mg / head / day for 14 days + feed standard 12 grams / day + Aquadest in ad labitium (G3) an increase in levels of hemoglobin average of 4.74 g / dl, the number of erythrocytes 2.53 million / ul, 18:26% hematocrit values. The higher the dose of flour "Nyale" given to white rats with anemia, the higher the increase in levels of hemoglobin, the red cell count and hematocrit values. The third parameter is an indicator to monitor the incidence of anemia and their treatment journey.

Statistical test results oneway ANOVA showed that there is significant influence flour Award "Nyale" on levels of hemoglobin, number of erythrocytes and blood hematocrit values of white rats with anemia.

Increased levels of hemoglobin, the red cell count and hematocrit values associated with high nutrients contained by marine worms "nyale" include protein, iron, vitamin C and other nutrients. This is consistent with the results of research Dwi Soelistya Dyah Jekti, 1999 shows that the levels of nutrients are high on nyale which contains protein 43.84%, fat 11.57%, carbohydrates 0.527%, phosphorus 1.17%, calcium 1.06%, magnesium 0.32%, sodium 1.69%, 1.24% potassium, chloride 1.05% iron and 857 ppm. Latumahina MCA in 2011 shows the test results proximate nutrient content of marine worms Lysidice Oele and Dendronereides heteropoda or worm Laor Water levels Maluku region is 81.51%, 13.92% protein, 1.01% fat, 2.41% Abu, Acid 1,265 amino Aspartate, Glutamate 1.63%, 0.38% serine, histidine 0.31%, 1.67% Glycine, Threonin 0.69%, 1.28% Arginine, Alanine 1.22%, 0.36 tyrosine %, Methionin 0.27%, 0.68% Valin, Phenilalanin 0.47%, isoleucine 0.68%, 1.08% Lysine, minerals, calcium (Ca) 636.86 ppm, 139.75 ppm Iodine, Vitamin C , B1, B6 and Vitamin B12 (Latumahina MCA, 2011). Rosidi in 2012 shows the test results of proximate nutrient content of marine worms are cultivated is the fat content of 1.01 to 2.34%, from 6.37 to 6.45% Protein and Amino Acids from 3.14 to 3.79%.

Proteins contained nyale is as high as 43.84% are very helpful in the prevention of anemia, because protein is the main constituent component of hemoglobin and erythrocytes. Protein plays an important role in the transport of iron in the body, therefore, on the condition of anemia due to reduced protein intake will result in transportations of iron is blocked, resulting in iron deficiency. Protein trandferin a glycoprotein synthesized in the liver, the body's role in iron metabolism because iron transporting transferrin in the circulation to a place that requires iron, such as from the intestine to the bone marrow to form new hemoglobin. Globin protein has an important role in the synthesis of hemoglobin, since hemoglobin is made up of globin and heme binding protein (Dian PK, 2011). Therefore, the provision of flour "Nyale" potential for prevention and control of anemia due to nutritional deficiencies. Iron is essential for the body microelements, as a factor in forming hemoglobin which transports oxygen to function. The

involvement of iron in the formation of hemoglobin that is in the final stages of the process of heme formation, at the time of incorporation of the ferrous iron into protoporphyrin III catalyzed by the enzyme ferroketalase. Iron contained in the enzyme are also required for electron transport (cytochromes), to activate the enzyme oxidase and oxygenase. Iron is also part of myoglobin contained in the muscle cells, which also serves to carry oxygen. To muscle cells. Other iron-containing compounds such as cytochromes, flavoproteins and compounds mitochondria play an important role in the oxidation process produces ATP. Iron in the body other than the functional to the formation of hemoglobin can also be stored in the body in the form of ferritin and hemosiderin, found in the liver, spleen and bone marrow, the willingness of enough iron, the formation of erythrocytes needs are met. Iron deficiency can cause a lack of concentration of hemoglobin and the number and size of erythrocytes. Iron deficiency anemia will cause the formation of erythrocytes (erythrocytes) with a small size (microcytic) and paler (hypochromic), so often referred to hypochromic anemia. The state of iron deficiency can be caused by iron intake through foods that are less, improper eating habits, lack of economic viability and infectious diseases. The content of iron and protein are high on nyale, lead can be used for the prevention and control of anemia (Arlinda SW, 2004; Riris O, 2009; Dian PK, 2011).

Vitamin C is an organic compound that plays an important role in the metabolism of food and physiology of the body, especially in the catalytic chemical reactions. Vitamin C also acts as a cofactor for the enzyme catalyst hydroxylation of proline and lysine in the biosynthesis of collagen, can inhibit the effects of phytate and tannin compounds where the compound is able to inhibit the absorption of iron. Vitamin C also has a role in the formation of hemoglobin in the blood, function of vitamin C helps the absorption of iron from food so that it can be processed into erythrocytes back. Iron absorption effective and efficient require acidic conditions and the presence of reducing agents such as vitamin C absorption of iron in the form of non-heme can be increased four-fold, so if there is a deficiency of vitamin C, the amount of iron absorbed is reduced which causes the number of erythrocytes decreased and Hb decreased (IS Joseph and Adelina, 2009). In addition, vitamin C can inhibit the formation of hemosiderin difficult mobilized to liberate the iron that the body needs. Vitamin C also has a role in the removal of iron and transferrin in the plasma to the liver ferritin (Dian PK, 2011). The content of vitamin C in nyale make nyale allegedly to prevent and cope with anemia. Folic acid is a vitamin that are grouped in vitamin B. This vitamin has a role in the process of DNA synthesis is the process of methylation in the formation of purine and pyrimidine bases, the impact of folic acid deficiency causes disruption of DNA metabolism, resulting in morphological changes in the nucleus of cells, especially cells very rapidly divide, such as blood cells, especially erythrocytes in bone marrow, white blood cells, the cells of the vagina, cervix cells and epithelial cells of the GI tract. Cells that are affected this will appear as the cells with a larger size so that the so-called macrocytic anemia. Deficiency of vitamin B12 because of the inability of the digestive tract to absorb vitamin B12 in the optimal amount can also cause anemia circumstances. Vitamin B12 deficiency usually occurs in Diphyllobothrium latum infestation of worms that live in the intestines. Vitamin B12 is needed in the process of maturation of erythrocytes, granulocytes and platelets, anemia called pernicious anemia. Deficient vitamin pyridoxine (B6) began to be considered as a cause of anemia (Sadikin M, 2001). Flour "Nyale" contains vitamins B1, B6 and B12 so that it can be used as an alternative food items to prevent anemia.

The results of the research value of the index of erythrocytes MCH, MCV and MCHC in rats before and after the study had a difference value varies in all treatment groups. For the average difference in index of erythrocyte MCV in the negative control group (G1) increased 12.18 fl, positive control group (G2) increased 12.43 fl, group administration of flour "Nyale" 36 mg (G4) increased 0.71 fl, group administration of flour "Nyale" 54 mg (G5) increased 1.89 fl, whereas in the group treated flour Award "Nyale" 18 mg impaired red cell indices MCV 0.06 fl. MCH erythrocyte index values in all treatment groups decreased after treatment, the group decreased by 0.33 pg G1, G2 ecreased by 0.45 pg. G3 decrease of 12.08 pg, a decrease of 0.72 pg G4 and G5 decreased by 0.93 pg. Value index of erythrocytes MCHC in all treatment groups also decreased after treatment is to group G1 impairment index of erythrocytes MCHC at 1.09 g / dl, G2 decrease of 1.44 g / dl, G3 decrease of 0.07 g / dl, G4 a decrease of 1.68 g / dl and G5 decline of 2.43 g / dl.

Giving flour "Nyale" against the index results erythrocyte MCV, MCH, and MCHC although there is a decrease in some groups of experimental animals, but still within normal values, this was due to the possibility of ferritin levels in experimental animals normal or slightly high so that the induction treatment $NaNO_2$ no effect , adding Ferriz in the G2 group does not also have an effect on the value of MCV, MCH and MCHC due to excess Ferriz will accumulate in the liver as a form of ferritin stored. Because it should be done measuring ferritin levels and peripheral blood smear examination so that it can be classified type of anemia is normochromic normocytic or microcytic hypochromic, it was a weakness of this study because it is no examination of ferritin levels and peripheral blood smear examination.

5. CONCLUSION

Flour "Nyale" the potential for elevated levels of hemoglobin, red cell count, hematocrit, red cell indices MCV and MCHC in the blood of white rats with anemia.

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