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Implementation of Genetic Algorithm Theory in Determining the Composition of Food Ingredients

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Abstract - The problem of determining the structure of the elements of food that is good for daily use is a problem that looks small but is actually important for the health of the body. A hereditary calculation that has an unwavering quality in creating an ideal result can be used for this problem. In this review, 138 information about food ingredients and their substances were used for testing. Information will be handled with hereditary calculation techniques that combine the processes of recognition, assessment, recombination, hybrid and change. From this information a population will be formed which has a population size of 20 and each chromosome has 10 qualities where the value of each quality is the file quantity of food ingredients in the data set. The hybrid probability values and the changes used were 0.7 and 0.05. The best mixes of foodstuffs are those which, when added together for each healthful substance, will yield values that most closely approximate the amounts required for each type of nutrient required in a day. The value of the amount of aggregate required.

Keywords: Genetic Algorithm, Composition, Food Ingredients

1. PRELIMINARY

In this day and age, with technology, all human work can be done more easily and efficiently so that there is no need for full supervision of a job [2]. Besides that, we should keep up with technological developments that are increasingly sophisticated, so that we are not left behind by other developed and developing countries. With the development of technology, it is hoped that it can be used for the good of the general public.

Every day our bodies need nutrition and nutrition that are in accordance with their needs so that the body becomes stable and not susceptible to disease. With the development of food technology at this time, there are so many types that people are confused about choosing good food and according to the needs of the body [1].

Our bodies need food as a source of energy, vitamins, and for human growth itself. But it is not an easy thing to choose foods that contain it, because there are also foods where the nutrients are not needed by our bodies. Therefore we need to look together in choosing the composition of food ingredients for the body so that it has an intake that is in accordance with the body's needs [3].

The application of the algorithm in determining the composition of food ingredients can answer the concerns that exist in the community, can be a solution for the community in determining the composition of food ingredients that are good and in accordance with the needs of the body. So that people can live healthy and avoid all kinds of diseases that are increasingly dangerous because of the large content of chemical substances in today's food.

2. LITERATURE REVIEW

In previous studies using genetic algorithms in determining the composition of laying hens feed ingredients, where this genetic algorithm is known as population technique, namely by looking for a possible solution at once. [4]. The population is a collection of chromosomes which becomes a problem solving picture of each problem. From this, it is expected that new offspring will be born and are superior to the previous population.

In this study using a selection method where each will be compared using random numbers generated by the number of chromosomes. In the results of the study, it was found that in determining the composition of laying hens feed ingredients could be made by applying a genetic algorithm that makes software. However, this study only determined the composition of laying hens feed ingredients.

In today's era there is a need for research on determining the composition of food ingredients. Because with a variety of food products that are present around us and most people are still unfamiliar with the composition of what foods are needed by our bodies. Therefore, the existence of this research can be used as a benchmark and material for improvement in this research to develop. The difference is that previous research was conducted to determine the composition of laying hens feed ingredients, but in this study it was conducted to determine the composition for food ingredients using the same theory, namely algorithm theory.

The technique used to find solutions that may be known as population is the genetic algorithm. Those contained in a population are called chromosomes. This chromosome is a solution that is still in the form of a symbol. The initial population is built randomly, while the next population is the result of the evolution of chromosomes through literacy which is called the generation. In each generation, the chromosomes will go through an evaluation

process using a measuring instrument called the fitness function. The fitness value of a chromosome will indicate the quality of the chromosomes in the population. Nutrients are organic substances needed by organisms for normal functioning of body systems, growth, maintenance of health. Nutrients are obtained from food and fluids which are then assimilated by the body. Research in the field of nutrition studies the relationship between food and drink on health and disease, particularly in determining the optimal diet [1].

3. METHOD

In this study using the theory of algorithms. This algorithm theory has been implemented a lot in life to solve existing problems [5]. What inspires the existence of this genetic algorithm theory is the existence of an evolutionary process, this genetic algorithm theory in the selection process is carried out naturally [6]. The application of this theory is to obtain the maximum solution from all possible solutions [7]. The theory of genetic algorithms is a technique based on the genetics of living things that has a genetic principle, namely the development of a natural offspring and the principle of the natural selection process [8]. According to Yandra Akerman and Kudang Boro Seminar, genetic algorithm is an optimization and search technique that functions to imitate the main process and see changes to the genetics of living things [9]. In the application of the theory of genetic algorithms, previous studies have been carried out and the results are good and effective in determining the composition of food ingredients [10].

4. RESULTS AND DISCUSSION

Furthermore, hereditary calculations will be used, regarding the limits used are as follows:

- Number of genes in 1 chromosome = 10
- Number of chromosomes in 1 population = 20
- Maximum generation = 100
- Probability of crossing over = 0.7
- Mutation probability = 0.05

The following is a picture of the results of his research:

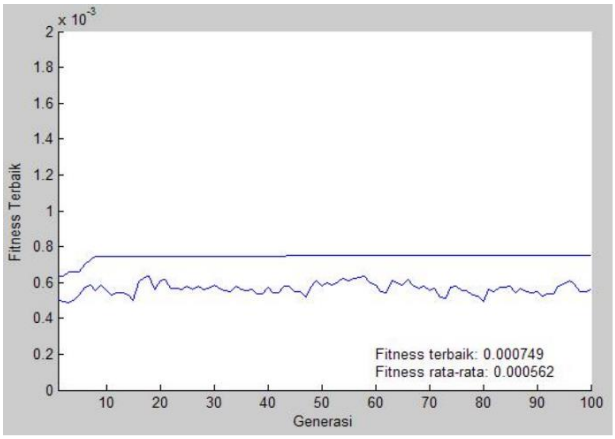

Figure 2: Research Results for 100 Generations

Best selected chromosome:

131	109	131	40	103
82	107	15	25	6

If the chromosome is returned as an index of the number of foodstuffs in the food database, it will produce foodstuffs, namely:

1. Thick coconut milk
2. Oncom
3. Thick coconut milk
4. Avocado
5. Beef Intestines
6. Beef curd
7. Boiled peanuts
8. Bayem
9. Young jackfruit
10. Radish

In the results above, food ingredients appear 2 times. This shows that the food is consumed 2 servings.

The results of calculations using genetic algorithms using different generations can be seen in table 1. Figure 2-6 is a graph of the best fitness and average fitness of a population with the number of genes 150,200,300,400 and 500.[1]

Jml generasi	Kromosom terbaik				
100	131	109	131	40	103
	82	107	15	25	6
	Fitness terbaik : 0.000749				
150	126	36	90	110	16
	16	107	18	101	90
	Fitness terbaik : 0.000764				
200	16	113	36	97	102
	126	18	102	43	18
	Fitness terbaik : 0.000749				
300	33	103	83	105	102
	87	100	93	16	25
	Fitness terbaik : 0.000766				
400	102	91	81	91	26
	10	68	124	102	102
	Fitness terbaik : 0.000755				
500	111	91	81	124	6
	95	35	81	111	18
	Fitness terbaik : 0.000750				

Table 3: Calculation results with different generations

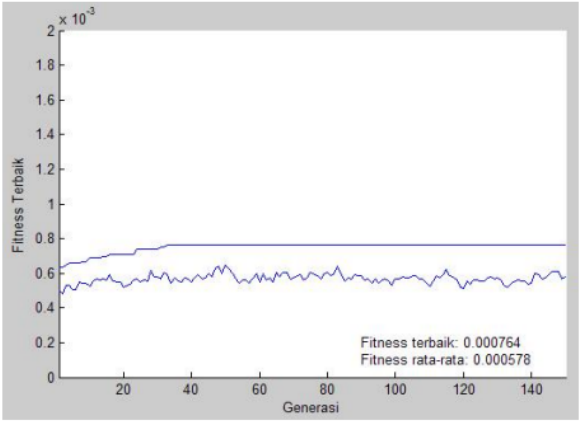

Figure 2: Training results for 150 generations

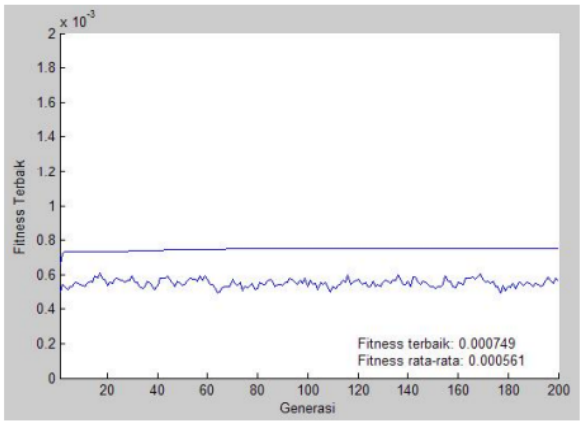

Figure 3: Training results for 200 generations

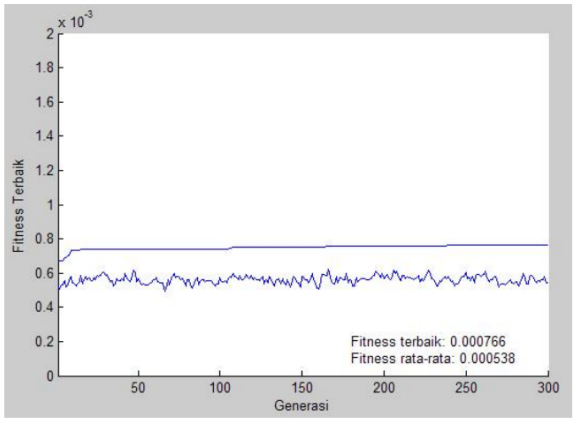

Figure 4: Training results for 300 generations

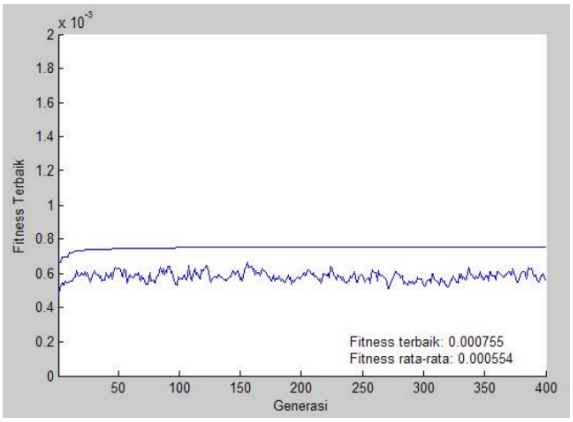

Figure 5: Training results for 400 generations

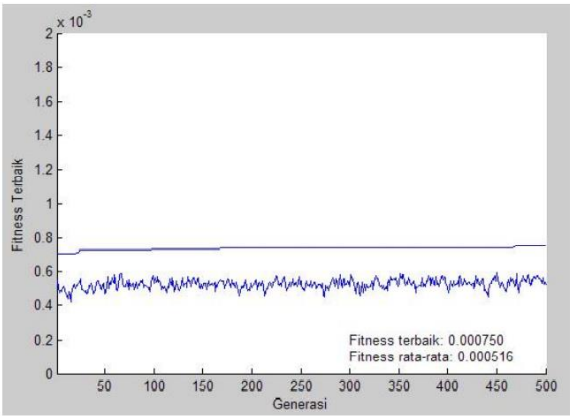

Figure 6: Training results for 500 generations

5. CONCLUSION

Previous research used genetic algorithms in determining the composition of laying hens feed ingredients, where this genetic algorithm is known as population technique by looking for a possible solution at once. In this study using a selection method where each will be compared using random numbers generated by the number of chromosomes. In this day and age, there is a need for research on determining the composition of food ingredients.

In this study using the theory of algorithms. This algorithm theory has been implemented a lot in life to solve existing problems.

From the results of the examination, it can be said that:

a. Synthesis of foodstuffs can be controlled by hereditary calculations.
b. Hereditary calculations can produce ideal food ingredients to overcome nutritional problems in 1 day.
c. Can keyword calculations can be used to determine the ideal organization of foodstuffs to address dietary problems in 1 day for people undergoing a careful nutrition plan for kidney and urinary tract diseases.

REFERENCE

[1] T. Rismawan and S. Kusumadewi, “Aplikasi Algoritma Genetika Untuk Penentuan Komposisi Bahan,” *Semin. Nas. Apl. Teknol. Inf. 2007 (SNATI 2007)*, vol. 2007, no. Snati, pp. 1–5, 2007.

[2] D. Saputra, M. Safii, M. Fauzan, and S. Tunas Bangsa, “Implementasi Algoritma Backpropagation Dalam Memprediksi Harga Bahan Pangan,” *Oktober*, vol. 1, no. 4, pp. 120–129, 2020.

[3] N. Florida, C. López, and V. Pocomucha, “CORE View metadata, citation and similar papers at core.ac.uk,” vol. 2, no. 2, pp. 35–43, 2012.

[4] A. Aribowo, S. Lukas, and M. Gunawan, “Penerapan Algoritma Genetika Pada

Penentuan Komposisi Pakan Ayam Petelur," *Semin. Nas. Apl. Teknol. Inf.*, vol. 3, no. 4, pp. 21–24, 2018.

[5] M. I. Kamil, *Optimasi penentuan bahan pangan harian atlet sepakbola menggunakan algoritma genetika untuk memenuhi kecukupan gizi skripsi*. 2014.

[6] S. Uyun, Shofwatul. Hartati, "Penentuan Komposisi Bahan Pangan Untuk Diet Penyakit," *Seminar*, vol. 2011, no. Snati, pp. 17–18, 2011, [Online]. Available: http://journal.uii.ac.id/index.php/Snati/article/view/2196.

[7] Z. Fitriah, J. Matematika, and U. Brawijaya, "KNPMP III 2018 ISSN : 2502-6526 PENGEMBANGAN ALGORITMA GENETIKA UNTUK ISSN : 2502-6526 Book of KNPMP III 2018," pp. 722–730, 2018.

[8] C. Rozikin and A. Solichin, "Implementasi Algoritma Genetika dan Regresi Linier Berganda Untuk Prediksi Persediaan Bahan Makanan Pada Restoran Cepat Saji Implementation Of Genetic Algorithm and Multi-Linear Regression For Predicting Food Supplies At Fast Food Restaurants," *Semin. Nas. Multidisiplin Ilmu 2017*, no. April, pp. 10–17, 2017.

[9] J. Hasyir, *(Studi Kasus : Rumah Sakit XYZ Di Pekanbaru)*. 2019.

[10] P. S. Informatika, U. Internasional, and S. Indonesia, "Penerapan Algoritma Genetika untuk Menghitung Biaya Optimal Komposisi Bahan Makanan pada Penderita Uric Acid," vol. 11, no. September, pp. 6–13, 2021, doi: 10.34010/jati.v11i2.