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Application of Project Based Worksheet to Develop Students' Scientific Performance through Making Hand Cream from Black Rice Kefir

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ABSTRACT

This study aims to describe the learning process and analyze the development of students' scientific performance through the application of project-based worksheets in making hand cream from black rice kefir *(Oryza sativa L.indica)*, as well as analyzing the characteristics of the hand cream products produced. The research was conducted at SMK MVP ARS International Bandung in class XI Pharmacy. The research approach used was quantitative with pre-experimental method and one shot case study design. The results showed that students' activities in the learning process reached a score of 93 and scientific performance obtained an average score of 89, both in the very good category. Product characterization showed that all formulations of hand cream from black rice kefir *(Oryza sativa L.indica)* met SNI standards with excellent quality based on pH, organoleptic, irritation, homogeneity, spreadability, and emulsion type parameters, and obtained a product assessment with an average score of 96. The LC50 value obtained from the antioxidant test results was 90.5500 (Strong). These findings indicate that the application of project-based worksheets is effective in developing students' scientific performance while producing quality products.

Keywords: Project Based Worksheet; Scientific Performance; Hand Cream; Black Rice Kefir *(Oryza sativa L.indica)*

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INTRODUCTION

Chemistry is a science that is studied through experiments in the laboratory, with two main aspects: products and processes (Saputra & Kurniawati, 2021). The product aspect includes understanding chemical facts, concepts, theories, and principles, while the process aspect relates to scientific skills through practicum (Sari et al., 2019). Practicum is effective because it connects theory and hands-on practice (Sasongko, 2020). However, the implementation of practicum still faces various obstacles, so a learning model that supports students' analysis and understanding is needed. One of the relevant approaches is the project-based learning model (Al-Habbah & Suparji, 2015).

Project-based learning helps students construct concepts through the creation of real products, which enhances learning outcomes and scientific process skills (Wulandari, 2016). Fatmala et al., (2023) showed that project-based learning for making conditioners from aloe vera can develop students' scientific performance. In order for the implementation of this model to be effective, learning instruments such as worksheets that are able to direct students during the practicum process are needed (Sari et al., 2019).

In the context of learning pharmaceutical chemistry at vocational high schools, semi-solid dosage materials are an important part because they include practical skills in the formulation and evaluation of pharmaceutical products such as ointments, creams, and gels (Sitompul, 2022). Understanding basic pharmaceutical technology is very important for students to be able to apply their knowledge in the world of work (Anugrah & Winanta, 2021). One of the practical implementations of this material is the making of hand cream made from natural ingredients, such as black rice kefir *(Oryza sativa L.indica)*, which is an innovation in line with the trend of using natural ingredients in cosmetic products.

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High public awareness of environmentally friendly products is driving the demand for products made from natural ingredients up 60%. By 2022, about 75% of cosmetic products will already contain natural ingredients, and it is estimated that this number will continue to increase every year (Cahayani et al., 2024). In addition, the increasing public awareness of the importance of skin health care is one of the drivers of the increase in demand for cosmetic products for skin care (Aljanah et al., 2022).

Cosmetic products based on black rice *(Oryza sativa L. indica)* show significant potential antioxidant activity, thanks to the content of bioactive compounds such as anthocyanins, flavonoids, tannins and triterpenoids. These compounds play a role in counteracting free radicals, which can help protect the skin from premature aging and oxidative stress damage (Febram et al., 2021). Besides black rice *(Oryza sativa L.indica)*, natural food-based antioxidants are also found in fermented milk. Kefir is a fermented milk product that is quite popular in many countries and is believed to boost the body's immunity, so this fermented milk is often consumed (Windayani et al., 2023). The use of kefir is not only as a probiotic drink to overcome metabolic problems, but it has many benefits for maintaining healthy skin (Dewi et al., 2018). This makes black rice kefir *(Oryza sativa L.indica)* a potential ingredient for use in skin care products, such as hand creams. Hand creams made from natural ingredients are still very limited, so the innovation in this research is the manufacture of hand cream from black rice kefir *(Oryza sativa L.indica).*

Black rice kefir (*Oryza sativa L.indica)* is derived from the fermentation of grain kefir in black rice *(Oryza sativa L.indica)* starch water. Kunnaryo & Wikandari's research (2021) on anthocyanins in fermentation production and their role as antioxidants states that the fermentation process of lactic acid bacteria (LAB) lowers pH and inhibits the activity of polyphenol oxidase (PPO) enzymes, thereby increasing anthocyanin stability and increasing antioxidant activity. The study also showed that the antioxidant activity of rice milk kefir was higher than that of milk kefir (John, 2021).

Although black rice kefir has great potential as a skin lightening agent and antioxidant, this is based on the research of Yang et al., (2025) who highlighted that rice fermentation products contain ferulic acid, γ-oryzanol, vitamin E, and peptides that are strong as antioxidants, and reduce tyrosinase activity. Research on black rice for the cosmetics industry is still rarely done so that black rice can be utilized as a basic ingredient for making cosmetics (Inggrid, 2025), such as hand cream cosmetic products. In addition, there is no research that specifically develops project-based worksheets to develop students' scientific performance through the making of black rice kefir hand cream.

Based on the background that has been explained, this study aims to describe the learning process and analyze the development of students' scientific performance through the application of project-based worksheets in making hand cream from black rice kefir *(Oryza sativa L.indica)*, as well as analyzing the characteristics of the hand cream from black rice kefir *(Oryza sativa L.indica)* products produced. This process is expected to develop students' scientific performance in the aspects of planning, implementation, and reporting results.

METODE

This research was conducted at MVP ARS International Vocational School in Bandung with the research subject being class XI students majoring in Pharmacy. The research focused on the subject of Pharmaceutical Technology, especially on semi-solid dosage materials. The choice of this research is based on the need for pharmacy learning that demands practical skills and scientific understanding (Sitammu, 2017). The project-based approach is considered effective for developing students' critical thinking, collaboration, and innovation skills (Kasmadi & Lestari, 2025). In addition to improving scientific performance, this research also produces real products that meet quality standards (Suranto et al., 2023), making it relevant to be applied in vocational schools.

This study used a quantitative approach with a pre-experimental method. The design used was a one shot case study, which only involved one experimental class without a comparison class and without an initial test (Andi et al., 2019). The instruments in this study were project-based worksheets, student activity sheets, scientific performance assessment sheets, and product assessment sheets. Kelas XI Farmasi yang terlibat dalam penelitian ini terdiri dari 16 siswa yang dibagi kedalam 3 kelompok kerja. Pembagian kelompok ini bertujuan untuk memfasilitasi pembelajaran kolaboratif dalam pelaksanaan proyek (Loka & Robiah, 2024). Each group followed the stages of project-based learning which included: 1) Analyzing the problem, 2) Designing the project, 3)

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Implementing the project, 4) Developing the draft/prototype, 5) Assessing the product, 6) Finalizing and publishing the product (Sari et al., 2019).

Data collection techniques in this study include validation sheets from chemical education expert lecturers to determine the validity of the student worksheets applied, student activity observation assessment sheets, assessment of student worksheets, scientific performance assessment sheets for the implementation of project-based worksheet, and product assessment sheets for product characteristics. The data obtained in this study were calculated using the formula:

$$\text{Assessment} = \frac{number\ of\ scores\ obtained}{maximum\ number\ of\ scores} \times 100$$

Then the data is interpreted into the average category of learning outcomes which can be seen in Table 1.

Table 1. Score Interpretation *(Suharsimi, 2013)*

No	Average score	Description
1	80-100	Very good
2	66-79	Good
3	56-65	Fair
4	40-55	Deficient
5	30-39	Failed

A series of product characteristic tests included organoleptic test (color, aroma, and texture), visual homogeneity test, pH test using universal pH, spreadability test by measuring product spread area on a flat surface, in vivo skin irritation test, emulsion type test using methylene blue to determine emulsion type (O/W or W/O) and antioxidant activity test. All data were obtained through a product assessment sheet prepared based on the parameters of each test, then analyzed descriptively quantitatively using the average score formula which can be seen in Table 1.

RESULTS AND DISCUSSION

The implementation of project-based worksheets was carried out in two meetings. In the first meeting, the researcher explained the purpose of the experiment and gave directions for filling out the worksheet. The worksheet consisted of six stages according to project-based learning: analyzing the problem, designing the project, Implementing the project, making a draft/prototype, assessing the product, and finalizing and publishing the product.

The learning process includes the activities carried out by students during instruction and the completion of the student worksheets. Data related to student activities were obtained through activity observation sheets, while data regarding worksheet completion were obtained from the assessment results of the worksheets completed by the students. The results of the students' activity data processing are presented in Table 2.

Table 2. Recapitulation of Data Processing Results for Student Activities

No	Student activities at the project-based learning stage	Group			Average	Interpretasi
		1	2	3		
1	Analyzing the problem	83	83	75	80	Very good
2	Designing a product	100	100	88	96	Very good
3	Implementing the project	100	100	100	100	Very good
4	Develop product draft/prototype	100	100	100	100	Very good
5	Product assessment	75	83	100	86	Very good
6	Finalization and publication	92	92	92	92	Very good
	Group average score	92	93	93	92	Very good
	Interpretation	Very good	Very good	Very good		

Based on the data in Table 2, it can be seen that the activities of students during the learning process. Furthermore, an assessment of the results of the students' worksheets was carried out. The following is a data

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visualization of the results of the assessment of students' worksheets based on the stages of project-based learning in Figure 1.

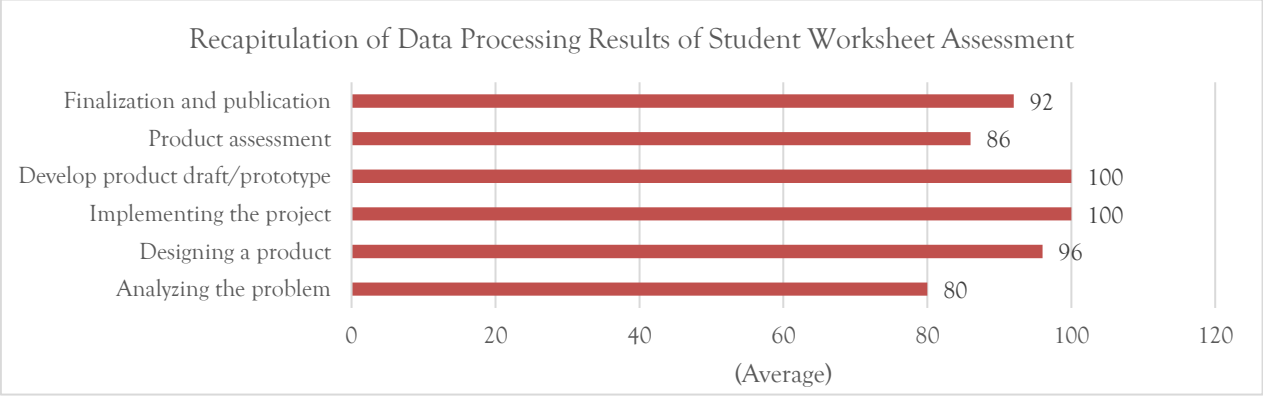

Figure 1. Recapitulation of Data Processing Results of Student Worksheet Assessment

At the problem analysis stage, learners receive a project-based worksheet, then are asked to observe the discourse contained in the sheet. Furthermore, they are directed to formulate two questions as a form of problem analysis from the discourse. Based on this formulation, learners are asked to formulate two relevant hypotheses. Furthermore, learners are directed to write the principle of making hand cream from black rice kefir *(Oryza sativa L.indica)*. Based on the observation, some learners looked confused when working on the worksheet given. This is caused by students who are not accustomed to utilizing worksheets as learning media and guides in carrying out practicum activities (Darojah et al., 2024). The activity of students at this stage reached a score of 80 (very good category). These results are supported by research by Fatonah et al., (2022) which shows that vocational pharmacy students struggle with critical thinking due to the lack of critical literacy and the use of technology.

Based on the analysis of the results of the worksheet, the average score of students in identifying problems, formulating hypotheses, and understanding the principles of making hand cream based on the discourse in the worksheet is 77, which is included in the good category. At this stage, each group is able to write two problem formulations, but only one formulation is correct, so the hypothesis is less appropriate. This is due to limitations in critical thinking because pharmaceutical vocational students are more accustomed to practice (Fatonah et al., 2022). However, all groups managed to determine the principle of the experiment well due to experience and understanding of the semi-solid preparation material that had been studied. The following shows the activities of students at the stage of identifying problems can be seen in Figure 2.

Figure 2. Student activity at the stage of analyzing the problem

At the project design stage, learners are directed to determine the tools, materials, and experimental procedures for making hand cream from black rice kefir *(Oryza sativa L.indica)*. The observation results show that learners are able to identify tools and materials well and compile procedures in the form of a flow chart based on the data contained in the worksheet. The learners' previous practical experience supported the smoothness of this process. The implementation of product design activities reached a score of 96 and the value of students' worksheet work in designing the design had an average of 100, both of which had a very good interpretation. These results are supported by Ahmad et al., (2023) which states that the project-based learning model has proven effective in improving students' scientific skills at the vocational education level. The following shows the activities of students at the project design stage can be seen in Figure 3.

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Figure 3. Student activity at the project design stage

At the stage of carrying out experiments, students are directed to carry out experiments that have been previously designed. In addition, students are directed to write down their observations on the worksheets provided. The observation results show that students are very skillful in conducting experiments and recording the results. This is because students are accustomed to direct practice in the laboratory. At this stage, students' activities were recorded as being carried out with a score of 100 including the excellent category. While the score of students' worksheet work in conducting experiments on making hand cream from black rice kefir *(Oryza sativa L.indica)* has an average of 77 with good interpretation. This shows that although participants excel in laboratory practice, they still face challenges in writing down the process and reflection systematically. This is in line with the findings of Jalinus et al., (2017) which show that vocational students tend to excel in technical skills, but need further coaching in academic abilities, including filling out worksheets. The following shows the activity of students at the stage of carrying out the experiment can be seen in Figure 4.

Figure 4. Student activity at the stage of carrying out the experiment

In the draft/prototype stage, students are directed to test the quality of hand cream from black rice kefir *(Oryza sativa L.indica)* produced and commercial hand cream products, which include organoleptic, homogeneity, pH, spreadability, irritation, and emulsion type tests. Based on observations at the draft/prototype stage, each group showed high activeness and enthusiasm in testing the hand cream products that had been made. Each group member plays a role by dividing the tasks to complete the entire testing process. Routine practical learning makes students accustomed to following the test stages systematically and thoroughly, so the results are satisfactory. At the stage of preparing the draft/prototype, the implementation of learner activities reached a score of 100 and the value of the worksheet obtained an average score of 100 with a very good interpretation. These results are in line with Suhartini (2024) which concluded that PjBL can be considered as an effective learning approach to improve learning outcomes and practical skills of students in vocational schools. The following shows the activities of students at the stage of preparing the draft/prototype can be seen in Figure 5.

Figure 5. Student activities at the product draft/prototype stage

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At the product assessment stage, learners compare the hand cream made with a commercial cream and make a discussion based on the experiment. Each group was guided to complete all the questions in the worksheet and prepare the presentation. The observation results showed that the level of learner activity at this stage reached a score of 86, while the average value of the worksheet work reached 89, which was categorized in a very good interpretation. The following shows the activities of learners at the product assessment stage can be seen in Figure 6.

Figure 6. Student activity at the product assessment stage

The finalization and publication stage is carried out through the making of posters of experimental results and presentations in front of the class. Presentations were made in groups, each group member alternately presented the results of the practical report that had been made. After the presentation, the activity continued with a question and answer session. The students showed active participation when presenting the products and experimental results. However, when the discussion session began, most students seemed to play a less active role in asking questions or expressing opinions, so the question and answer session was less interactive. The implementation of this stage reached a score of 92 with a very good category. The average value of poster reports and presentations is 90 with a very good category. The following shows the activities of students at the product finalization and publication stage can be seen in Figure 7.

Figure 7. Student activities at the product finalization and publication stage

The results of the observation of students' activities at each stage of project-based learning showed that students' activities during the implementation of project-based worksheets went very well, with an average of 92. The project-based learning model used in the study encourages students' active participation in learning through real project activities (Sari et al., 2025). These results follow the research of Darojah et al., (2024) that the application of project-based learning can increase student activity in the learning process. In addition, research by Wafiyah et al., (2020) shows that through PjBL, students can improve creative performance in completing the given project.

Analysis of the development of students' scientific performance is obtained from the results of scientific performance assessment during project-based learning using worksheets. Indicators assessed in the development of scientific performance are designing experiments, carrying out experiments and reporting experimental results. The results of the assessment of students' scientific performance at each stage of project-based learning are presented in Table 3.

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Table 3. Recapitulation of Data Processing Results of Students' Scientific Performance

No	Scientific performance indicators	Project-based learning stages	Kelompok			Average	Interpretation
			1	2	3		
1	Designing an experiment	Analyzing a problem	77	77	77	77	Good
		Designing a product	100	100	100	100	Very good
2	Carrying out the experiment	Carrying out the project	73	73	90	79	Good
3	Reporting the results of the experiment	Developing a product draft/prototype	100	100	100	100	Very good
		Product assessment	83	83	100	89	Very good
		Finalization and publication	88	86	96	90	Very good
		Group average score	87	87	94	89	Very good
		Interpretation	Very good	Very good	Very good		

At the stage of designing experiments in project-based learning includes the stages of analyzing problems and designing products. The problem analyzing stage includes the assessment of formulating problems, writing hypotheses, and determining experimental principles. The average score obtained at this stage was 77 with a good category. Each group was able to write two problem formulations, but only one formulation was correct. This inaccuracy has an impact on the writing of hypotheses that are less appropriate. Pharmacy vocational students have difficulty because they are less accustomed to critical and analytical thinking, and are more focused on practical skills. As a result, students' ability to formulate problems and formulate hypotheses systematically is still limited. This finding is in line with the results of research by Kurniawan et al., (2021) which shows that the level of critical thinking skills of vocational students is still low, so immediate efforts are needed to develop this ability. Meanwhile, in the experimental principle, each group can fill it in appropriately, because students have often learned about semi-solid preparations that use the principle of emulsion (Istiawati, 2016).

At the project design stage, the scientific performance assessment in project-based learning shows an average value that reaches a score of 100 with an excellent category, indicating that all students are able to design the project correctly and document the steps appropriately. These results are in line with the findings of a study by Ahmad et al., (2023) which showed that a project-based learning approach is able to improve students' scientific skills in vocational education, especially in terms of project design and development.

At the experiment implementation stage, the scientific performance assessment in project-based learning shows an average score of 79 with a good category. This shows that although students excel in practice, students still face challenges in writing down the process and reflection systematically when filling in the worksheet. This is in line with the findings of Agustin (2020) which shows that although vocational students have good practical skills, learners need the right learning approach to develop writing skills. Research by Hasibuan et al., (2025) mentioned that many vocational students have difficulty in preparing written reports even though they are active in practical activities.

In the scientific performance indicator, reporting the results of the experiment is related to the stages of project-based learning, namely the stages of preparing drafts/prototypes, assessing products and finalizing and publishing product results. At the draft/prototype stage, the scientific performance assessment in project-based learning shows an average score of 100 in the excellent category, reflecting students' active involvement and adherence to procedures.

At the product assessment stage, scientific performance assessment in project-based learning shows an average of 89 with a very good category, indicating that students are able to evaluate project results systematically based on scientific aspects and compile discussions accompanied by clear scientific reasons. These results are in line with the findings of Almuntasheri (2025), which showed that the project-based learning approach was effective in improving students' laboratory report writing skills.

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At the product finalization and publication stage, the scientific performance assessment in project-based learning reaches a score of 90 with an excellent category. This shows that students successfully complete the project with good quality and are able to convey the project results effectively. hese results are in line with research by Almuntasheri (2025) which states that the application of project-based learning can improve students' experimental result reporting skills. In addition, research by Al-Abdullatif & Gameil (2021) states that the application of Project-Based Learning (PjBL) is proven to contribute significantly to improving students' scientific performance, through active involvement in the scientific process.

Project-based learning as a form of application of material on semi-solid preparations, namely cream, obtained a fairly positive response from students. Although learners have made several cream-based products, learners showed a higher interest in making hand cream based on black rice kefir *(Oryza sativa L.indica)*. This is due to the utilization of natural ingredients that are considered interesting, as well as the fact that the hand cream belongs to the category of hand skin care cosmetics used in daily life.

Hand cream from black rice kefir *(Oryza sativa L.indica)* has gone through preliminary tests to get the best formulation. The discovery of the best formulation consisted of aquadest as solvent, glycerin as stabilizing agent, stearic acid as emulgator, liquid paraffin as emollient, triethanolamine as pH regulator (Indrawati, 2011), sodium benzoate as a preservative instead of parabens, which poses a risk of irritation (Kumalasari et all., 2019), essential oil in small amounts, as a fragrance (Rahim, 2022) and the active ingredient is whey black rice kefir *(Oryza sativa L.indica)*. The formula was modified into three formulas with different concentrations of aquadest and black rice kefir *(Oryza sativa L.indica)* whey. The formulation of hand cream from black rice kefir *(Oryza sativa L.indica)* can be presented in Table 4.

Table 4. The formulation of hand cream from black rice kefir *(Oryza sativa L. indica)*

Ingredients	Formulation (g)		
	F1	F2	F3
Whey black rice kefir	8	10	15
Stearic acid	15	15	15
Liquid paraffin	10	10	10
Triethanolamine	3	3	3
Glycerin	10	10	10
Sodium benzoate	0,2	0,2	0,2
Aquadest	54	52	47

Testing the characteristics of hand cream made from black rice kefir *(Oryza sativa L.indica)* includes six parameters, namely organoleptic test, homogeneity, pH, spreadability, irritation test, and emulsion type. The product assessment on this hand cream from black rice kefir *(Oryza sativa L.indica)* obtained an average score of 96 with a very good category. Data from the product characteristics test can be seen in Table 5.

Table 5. Product Assessment Data Processing

No	Aspects to be assessed	Group		
		1	2	3
1	Color	3	3	3
2	Odor	3	3	3
3	Texture	2	2	3
4	pH	3	3	3
5	Homogeneity test	3	2	3
6	Spreadability test	3	3	3
7	Irritation test	3	3	3
8	Emulsion type test	3	3	3
	Score obtained	23	22	24
	Total score	24	24	24
	Average score	96	92	100

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In the organoleptic test, all groups produced cream with a grayish white color, except group 1 which produced white cream. This is in accordance with SNI standard 16-4399-1996, the color of the cream does not appear dull (Tanjung et al., 2022). The grayish color in groups 2 and 3 was due to the higher concentration of black rice *(Oryza sativa L.indica)*, while group 1 used a lower concentration of black rice kefir *(Oryza sativa L.indica)*. The odor of the cream before the addition of essential oil tended to be sour, but the aroma disappeared after the addition of essential oil. The best texture was shown by group 3, with a soft consistency and balanced viscosity.

In the homogeneity test which aims to determine whether the cream preparation that has been made has no lumps in the sense that all ingredients are well homogenized. The results obtained by all hand cream formulas have good homogeneity, there are no lumps or coarse grains in the hand cream. This is in accordance with previous research conducted by Tanjung et al., (2022), a homogeneous cream preparation is indicated by the absence of a sandy texture in the cream. Furthermore, the pH test, based on the test results, in general the three serum formulations showed a pH value of 7, these results are in accordance with the pH provisions listed in SNI 16-4399-1996 regarding the allowable pH limit of 4.5 to 8.0 (Kristiani & Filadelfian, 2024). According to previous research by Tanjung et al., (2022) pH that is too acidic can cause irritation, while pH that is too alkaline can cause the skin to become scaly.

In the product spreadability test produced by each group in the range of 6-7, this result is in accordance with the ideal spreadability for hand cream preparations ranging from 5-7 cm (Tanjung et al., 2022). Good spreadability indicates that the product is easy to apply and evenly distributed on the skin. The irritation test conducted showed that there was no irritation reaction in all groups. This finding indicates that the hand cream based on black rice kefir *(Oryza sativa L.indica)* is safe and non-irritating to the skin. Based on the emulsion type test results, hand cream preparations containing black rice kefir *(Oryza sativa L.indica)* showed an oil-in-water (o/w) emulsion type. This is due to the proportion of oil phase that is less than the water phase in the formula (Ermawati et al., 2023), so that the oil can be evenly dispersed in water with the help of an emulgator and form an oil-in-water emulsion (Tanjung et al., 2022). The following results of making hand cream from black rice kefir (Oryza sativa L.indica) products can be seen in Figure 8.

(a) (b) (c)

Figure 8. (a) hand cream from black rice kefir product of group 1, (b) hand cream from black rice kefir product of group 2, (c) hand cream from black rice kefir product of group 3.

Based on the measurement of absorbance value and percentage inhibition of hand cream from black rice kefir *(Oryza sativa L.indica)* preparations at various concentrations (10-50 ppm), it can be observed that the higher the concentration of the sample, the absorbance value decreases slightly, and the percentage inhibition value increases, The LC50 value obtained from the results of this test is 90.5500, which indicates that the antioxidant activity of hand cream from black rice kefir *(Oryza sativa L.indica)* is classified as strong. This LC50 value is much higher than vitamin C (2.3591) which is a very strong antioxidant standard. The antioxidant activity test data can be presented in Table 6 and the relationship curve between %inhibition and concentration of hand cream from black rice kefir in Figure 9.

Table 6. Antioxidant Activity Test of Hand Cream from Black Rice Kefir *(Oryza sativa L.indica)*

Concentration (ppm)	Abs	% Inhibisi	LC50
10	0,490	26.50	
20	0,480	28.00	90.5500
30	0,470	30.00	

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Concentration (ppm)	Abs	% Inhibisi	LC50
40	0,455	32.00	
50	0,400	40.00	

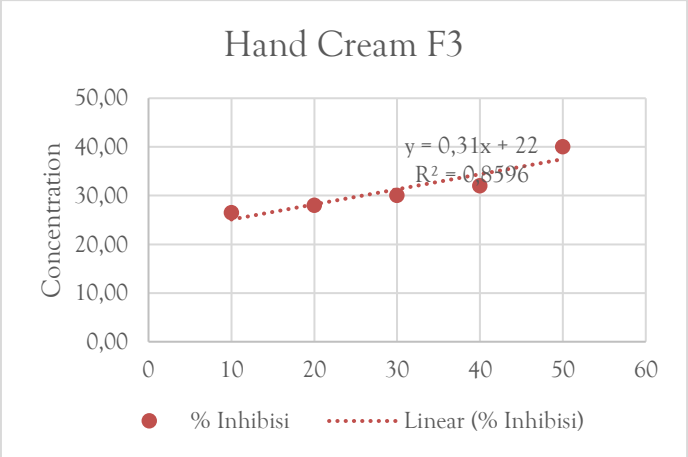

Figure 9. Relationship curve between %inhibition and concentration of hand cream from black rice kefir *(Oryza sativa L.indica)*

These results are in accordance with the research of Purnama et al., (2025) which shows pigmented rice (*Oryza sativa L.Indica*) as a source of natural antioxidant compounds, such as flavonoids, oryzanol, tocopherols, and anthocyanins. The main antioxidant compound in black rice *(Oryza sativa L.indica)*, anthocyanins, is very sensitive to changes in pH. At low pH (acidic), anthocyanins are more stable. However, at neutral to alkaline pH, their stability decreases, causing degradation and discoloration (Rohmani & Putri, 2022). Triethanolamine and stearic acid are used as emulgators in cream formulations. Variations in the concentration of these two ingredients can affect the physical stability of the cream, including homogeneity, pH, and viscosity. These changes in physical stability may impact the effectiveness of active compounds, including antioxidants (Witanti & Endriyatno, 2024). The decreased antioxidant activity could be due to the fact that the extract used in this study is not an extract so that the phytochemical compounds present are not in large quantities, unlike the case with extracts which can attract many phytochemical compounds (Rosaini & Umar, 2021).

CONCLUSION

Learners' activities in the application of project-based worksheets to develop scientific performance through the making of hand cream from black rice kefir *(Oryza sativa L.indica)* reached a score of 93 with a very good category. The scientific performance of students in the application of project-based worksheets to develop scientific performance through the making of hand cream from black rice kefir *(Oryza sativa L.indica)* obtained an average score of 89 with a very good category. The results of the characterization of hand cream from black rice kefir *(Oryza sativa L.indica)* showed that all formulations met SNI standards. This is shown through the test results which include pH, organoleptic, irritation, homogeneity, spreadability, and emulsion type with very good categories and the LC50 value obtained from the antioxidant test results is 90.5500 strong antioxidant category. Product assessment on this hand cream from black rice kefir *(Oryza sativa L.indica)* obtained an average score of 96 with a very good category. This research shows that the application of project-based worksheets is effective in developing students' scientific performance while producing quality products. The successful implementation of project-based worksheets is supported by the availability of tools and materials, the active role of the teacher as a facilitator, and the enthusiasm and collaboration of students. Relevant and applicable projects also increase learning motivation. However, challenges such as time constraints and obstacles in integrating theory and practice are still obstacles that need to be overcome

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