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Empowering Woman's Farmer Group (KWT) Mekar-Sari Kintamani in postharvest handling of Siamese oranges with the application of nanocoating-konjac

L Suriati[1], I K Selamet[2], N K Mardewi[3], A A S Manik_Cindrawati[4], N L P Sulis_Dewi[4], Y E I Lamadorok[1], and I PA Raditya_Putra[1]

[1] *Food Science and Technology Department, Faculty of Agriculture, Warmadewa University, Denpasar, Indonesia,*
[2] *Management Program Study, Economic Faculty, Warmadewa University, Denpasar, Indonesia*
[3]*Animal Husbandry Study Program, Faculty of Agriculture, Warmadewa University, Denpasar, Indonesia*
4 Master of Agriculture Science Study Program, Postgraduate program, Warmadewa University, Denpasar, Indonesia

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CORRESPONDING AUTHOR

*E-mail: *suriati_luh@yahoo.com*

A B S T R A C T

The rising demand for Siam Kintamani oranges is driven by heightened public health awareness. Its bioactive components benefit human health, but their quality is swiftly deteriorating. Oranges must be preserved using the Nanocoating-konjac application procedure. Nanocoating-konjac is an immersion-applied natural preservative solution derived from konjac. Efforts to develop the autonomy and welfare of a community are made through village community empowerment. The Woman's Farmer Group (KWT) Mekar-Sari (partners) is a group of women cultivators in the village of Pengejaran, Kintamani District, Bali Province, Indonesia, who require assistance to increase the shelf life of Siamese oranges. Using Nanocoating-konjac as a natural preservative for Siamese oranges can support community service objectives, such as enhancing (both soft and hard) skills and forming/developing economically and socially independent communities. By engaging in community service, partners gain the knowledge and abilities to manage natural resources and an entrepreneurial spirit, expanding their business and marketing opportunities. Community service activities are conducted through training using lecture methods, discussions, demonstrations, queries and answers, while an evaluation is carried out after handling the program. Seventy percent of the twenty group members who participated in community service had never preserved Siamese oranges, while thirty percent had done so. After participating in these activities, all members understand the materials and procedures, and they continue to apply nanocoating to citrus fruits based on what is marketed. Coating citrus fruits with nano-konjac adds value and becomes a community income source.

1. INTRODUCTION

1.1. Research Background

Village community empowerment is an effort to develop community independence and welfare by increasing knowledge, attitudes, skills, behavior, abilities, awareness, and utilizing resources. This can be done through the establishment of policies, programs, activities and assistance that are in accordance with the essence of the priority issues of community needs [1][2][3]. Pengjaran Village is one of the villages in Kintamani District, Bangli Regency, Bali. The boundaries of Pengjaran Village are as follows: to the north of Mengening Village, to the south of Selulung Village, to the east of Belantih Village, to the west of Catur Village. Pengjaran Village has an area of 666 hectares. The distance between the village of Pengajaran and the regency/municipality capital is ± 40 km, and the provincial capital is around ± 80 km. The total population is 789 people consisting of 407 men and 382 women. The physical potential of Pengajaran Village is that there is a waterfall located on the border of the village which has the potential as a tourist attraction, There are springs and abundant community garden products, and most of the village area is used as citrus and vegetable farming

land. The main source of livelihood for the people of Chase Village is farmers [2].

Women as mothers play a role in the utilization of rural resources related to the position of women as messengers [4]. Various development activities in the education sector encourage housewives to think creatively to develop themselves into quality women [5]. One of the women's groups in the village of Pengejaran is the Women Farmers Group (KWT). The location of the village of Pengejaran and this group is far from the crowds and is still lagging behind in terms of skills. The activities carried out by the KWT women ranged from helping their husbands to garden oranges, practicing dancing, practicing making ceremonial materials, and others. Mentoring activities will support members in understanding the postharvest handling of Siamese oranges with the Nanocoating-konjac application. The problem with the production of Siamese oranges in the village of Pengejaran is that they are very abundant but the postharvest handling is not good enough that the quality is not uniform during the main harvest, it declines quickly and the shelf life is short [5]. With the application of Nanocoating-konjac, it is hoped that post-harvest losses can be reduced, quality is maintained, and the shelf life is longer. Siamese oranges that do not meet the grade can be used as magot animal feed so that they provide added value and increase people's income.

This ability will also be practiced later to meet family needs, marketing Siamese oranges themselves without going through intermediaries. The market location is located in Kintamani District which is a favorite tourist destination with views of Mount Batur and Lake Batur which is very popular today. They asked to be taught how to make preservatives or edible coatings that use natural ingredients from konjac tubers which have not been used commercially so far [6]. Postharvest handling of Siamese oranges with the application of Nanocoating-konjac has better prospects and development opportunities. The use of Konjac Nanocoating for preservatives in Siamese oranges can support the goal of community service in higher education, namely providing solutions based on situation analysis according to needs, challenges or problems that exist in society [6]. In the post-harvest handling process, the type and quality of the raw material for Siamese oranges greatly influence the success of the application/coating process [1]. Therefore, it is necessary to develop postharvest handling with several improvement efforts to maintain quality and extend the shelf life of Siamese oranges [7]. Aspects of product quality and shelf life need to be studied for business development, and product marketing development [8].

The KWT Mekar-Sari Desa Pengejaran group chaired by Mrs. Ni Wayan Murtini, was formed on May 5 2018 with a total of 20 members. The group's activities only help pack Siamese oranges from the family's harvest in ordinary mica packaging without any efforts to maintain quality and extend the shelf life. Community service activities funded by the Community Service Institute of the Ministry of Education and Culture, the KWT Mekar-Sari Desa Pengejaran Group hopes that they will have skills and insights in managing natural resources and maintaining local wisdom and have an entrepreneurial spirit, so as to be able to open business opportunities and wider marketing, thus will be able to increase income and family welfare [9].

1.2. Literature Review

1.2.1. Siamese Orange

Siamese oranges are the only known and cultivated citrus species and varieties. The Rutaceae family has 1,300 species. Botanists group all members of this family into seven subfamilies and 130 genera, while the parent citrus plant is the Aurantioidae subfamily, namely 33 genera [7]. Siamese oranges are systematically included in the kingdom: Plantae, division: Spermatophyta, subdivision: Angiospermae, class: Dicotyledoneae, order: Rutales, family: Rutaceae, genus: Citrus and species: Citrus nobilis. Siamese orange (Citrus nobilis Lour) Kampar is a Siamese orange that is widely cultivated in Kampar Regency. It is called Siamese orange because it comes from Siam (Thailand) [10]. This plant is a plant that can grow well in tropical and subtropical areas. The characteristics of Siamese oranges are that the fruit flesh is not hollow and has a high-water content, and the fruit skin is yellowish green. About 70% -80% of the types of oranges developed in agriculture in Indonesia are Siamese oranges. The seed, cultivation, packaging, fruit juice and its derivatives industries, and information that utilize the rapid advances in information technology. So, the success of the development of citrus agribusiness in the production process is largely determined by the availability of quality seeds and well-available supporting agro-inputs. Careless harvesting, sorting and packaging of Siamese oranges can cause post-harvest yield losses of 2% and yield losses ranging from 5-10% during transportation [6]

1.2.2. Nanocoating

Nanocoating is an oil-in-water nano emulsion consisting of lipid nanodroplets (ranging from 10 to 100 nm in diameter) dispersed in an aqueous solution with unique physicochemical and functional characteristics[11]. Nano emulsions can enhance the transport of active ingredients as antioxidants, flavors, bioactive compounds or anti-microbial through biological membranes, thereby intensifying their bioavailability and effectiveness [12][13]. The advantages of using nanocoating are:

1) Antimicrobial ability: Nanocoating can interact directly with microbial cells, penetrate cell membranes, oxidize cell components, or produce secondary products that cause damage. They are also used to extend the shelf life of foods that are easily damaged by microbial activity such as meat and processed products, as well as minimally processed foods, etc.

2) Improved mechanical properties such as flexibility, durability, temperature, and humidity. This is related to the interaction between the nano-coating additive and the matrix, the movement of air and gas is increasingly difficult due to the tortuous paths. The nano coating mechanism also tends to reduce the matrix.

3) Improved emulsion system. The advantage of nano coating is that the droplets are much smaller which causes a decrease in the gravitational force, and prevents sedimentation, creaming, and flocculation to improve the emulsion system. Commonly used tools include high-pressure homogenizers, ultrasonic disruptors, and high-speed blenders.

4) Bioavailability: Nano coatings are expected to increase bioavailability to increase absorption of bioactive components. The very fine and small size of the material causes an increase in the solubility rate which is higher and evenly distributed.

1.2.3. Konjac

Konjac or often referred to as iles-iles belongs to the Araceae family and is one of the biological riches of Indonesian tubers [14]. As a plant that produces carbohydrates, fats, proteins, minerals, vitamins and dietary fiber, konjac plants have long been used as food ingredients and exported as industrial raw materials [15]. However, this plant has not been widely cultivated. Farmers generally only take and utilize plants that grow wild in the forest, in the fields under bamboo clumps, along river banks and mountain slopes. During the Japanese colonial era, people were forced to collect tubers for their food and industrial needs. However, later the cultivation of konjac plants was less developed, as well as the processing/processing of it into glucomannan flour[16].

Fig. 1. The research results of the proposed application of Nanocoating-konjac on Siamese oranges

1.2.4. Essential Oil Additives

In recent years, restrictions on the use of chemical, synthetic fungicides have been implemented in an effort to eliminate their use and encourage the use of alternative, natural products, meeting consumer demand for fresh produce free of harmful chemical residues [17]. At its core natural product research, including essential oils from aromatic and herbal plants and other natural compounds has begun to gain interest. Therefore, it is very important that the edible coating applied to fresh produce is able to eliminate the development of postharvest diseases and at the same time can improve and/or maintain the quality attributes of the product being processed[18]. Essential oils have been shown to have antifungal activity (among other properties), including thyme, oregano, cinnamon, clove, eucalyptus, rosemary, garlic essential oils. This activity can be observed either by direct contact via immersion in the solution or by application of steam[18].

1.3. Research Objective

The purpose of this community service is to form or develop an economically and socially independent community, help create peace and comfort and improve skills (soft skills and hard skills), insight into managing natural resources and an entrepreneurial spirit, thereby opening up business opportunities and marketing of Siamese oranges more broadly..

2. MATERIALS AND METHODS

2.1. Training materials

To realize the goals described above, the partners will be given a set of knowledge regarding postharvest handling insights, knowledge about edible coatings made from konjac tubers or Nano-konjac coating, Nano-konjac application methods on Siamese oranges, including how to pack and label, store products that have a longer shelf life. Partners are also given knowledge about entrepreneurship and product marketing. With the knowledge package provided, it is hoped that it can provide knowledge and skills that can enrich the competence of partners as an entrepreneurial group helping husbands in postharvest handling of Siamese oranges.

To support the training process for postharvest handling of Siamese oranges with the Nanocoating-konjac application, the following infrastructure is needed: 1) A leaflet containing instructions on how to postharvest handling of Siamese oranges, the manufacture of Nanocoating-konjac and its application method on the surface of the fruit, the utilization of citrus fruits outside the grade becomes magot feed products. 2) Schedule of activities and time required. 3) Tools for postharvest handling of Siamese oranges and the manufacture of Nanocoating-konjac. 4) Consumable materials, namely materials used to make Nanocoating-konjac and Siamese orange packaging.

2.2. Implementation Method

The implementation method is the pattern or system of actions to be carried out or the sequence and stages necessary in carrying out community service activities. The implementation method that will be carried out includes coaching, training, mentoring, structured consultation on various matters that become obstacles in an effort to provide added value to partners. The achievement of implementation objectives is determined by the implementation process. One way to achieve that goal is to use the right method. The method is one of the tools to achieve the goal. The method in relation to achieving implementation objectives so that it can be entered in long term memory is also an aspect that can facilitate the implementation path towards what has been formulated. Various methods that can be applied in the implementation of community service include: lectures, questions and answers, discussions, demonstrations, modeling, inquiry, simulations, games, role playing, and others. These methods can be implemented separately or implemented in combination according to the abilities and characteristics of the material being studied.

This community service activity program is carried out by means of training through lecture and discussion methods, demonstrations and training, as well as question and answer. a) Lecture and Discussion Method: This community service activity will begin with giving lectures and counseling to housewives who are members of the Mekar-Sari KWT in the Pengejaran Village. These women were gathered in a room with the implementation team to give lectures on activity material. The material provided

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is related to the process of postharvest handling of Siamese oranges, the manufacture of Konjac Nanocoating and its application methods, packaging, entrepreneurship and marketing. This activity aims to provide theoretical knowledge to mothers about the material for the activities to be carried out. The activity was then continued with the discussion method to deepen the respondents' understanding of the product of postharvest handling of Siamese oranges, learning media. During the implementation of this activity, more pictures and explanations were shown regarding the post-harvest handling of Siamese oranges, the manufacture of Konjac Nanocoating and its application methods, packaging, entrepreneurship and marketing in the hope that respondents could understand more quickly. 2) Demonstration and training methods: Demonstration and training activities are follow-up activities carried out by community service practitioners regarding the lectures and discussions that have been carried out. This activity was carried out by demonstrating the process of postharvest handling of Siamese oranges, the manufacture of Konjac Nanocoating and its application methods, packaging, entrepreneurship and marketing.

2.3. Implementation Stages

This community service activity includes the stages of preparation, implementation and post-program handling.

A. **The preparatory phase** includes the following activities:

1) Socialization of the training program, carried out in the community through the meeting program by inviting the community and housewives who are members of the KWT Mekar-Sari Pengejaran Village. 2) Recruitment of training participants which is planned to be attended by as many as 20 people, taken by representatives from the sub-village. 3) Preparation of training facilities and infrastructure or post-harvest handling practices including the schedule of training activities.

B**. Implementation phase:** The training will be held for 2 days planned for June 2023 which will take place at the Hall of Pengejaran Village. Implementation of activities carried out based on a schedule that has been prepared.

At the end of the activity, an evaluation is carried out, namely an evaluation of mastery of knowledge and skills.The stages of implementing community service activities in the Pengejaran village are as follows:

Literature study: the literature needed is knowledge about the process of making processed taro products as well as knowledge about materials for post-harvest handling of Siamese oranges, making Nano-konjac coatings and their application methods, packaging, entrepreneurship and marketing so that the resulting products have added value.

Analysis of the community situation: this is a very important start because community service starts with the intention to help the community. This stage is carried out with two sub-stages, namely the first determines partners, the wider community, certain communities, certain audiences or organizations or certain people in society. The second is to determine the problem areas to be analyzed in a comprehensive manner, which means trying to find, view and study all the problems faced by partners. This requires a multidisciplinary approach. It can also be limited, meaning that it is only limited to two problem areas.

The situation analysis that will be carried out is observing the process of postharvest handling of Siamese oranges, the manufacture of Nanocoating-konjac and its application methods, packaging, entrepreneurship and marketing carried out by partners, observing the quality of the Siamese oranges produced, observing the production equipment used, observing the business management used run.

Identification of problems: The results of the analysis work which includes the targets and problem areas can be found and then the problems faced by the selected target group can be formulated. In this stage the target will be handled through community service activities later.

Define specific work goals. At this stage it can be determined which new conditions you want to produce through community service activities later. In other words what changes would be desired that would make the work goals clearer.

Problem solving plan. Problems that have been identified need to be solved and at the same time achieve the goals that have been set by finding alternative solutions to problems and choosing the best alternative.

Social approach. The principle is that the target community is the subject and not the object of this community service activity. For this reason, efforts are made to involve the community as much as possible, by trying to make an approach and make them aware that the problems that have been formulated above must be solved. Furthermore, if you are unable, then this is where the executors and universities take a role so that they can improve the partners' lives.

Implementation of Activities. Prior to the implementation of the activity, a work plan is prepared which includes determining how the activity will be carried out, determining the implementation time, determining the implementation places, determining the people who will be involved in the activity.

Evaluation of activities and results. Each stage needs to be evaluated to be able to move on to the next stage, which needs improvements during the activity process. Equally important is the evaluation of the results or impact of all community service activities, so that you not only know what the results of the activities so far are but also learn how to identify and measure the changes that have occurred. This evaluation will produce a form of accountability for everything that has been done before. The results of this evaluation are not only important as administrative completeness but are also very important to be known by everyone involved, including the target community.

2.4. Post Program Handling

Evaluation is carried out by giving questionnaires to participants to determine the level of success of this activity. It is hoped that the implementation of this community service activity will run smoothly, the participants will be enthusiastic and active in participating in the training from start to finish so that it can motivate the women of the KWT Mekar-Sari Pengejaran village group to be able to handle post-harvest handling of Siamese oranges, manufacture Nanocoating-konjac and method of application, packaging, entrepreneurship and marketing.

3. RESULT AND DISCUSSION

Improper post-harvest handling results in non-uniform harvest quality, rapid decline and short shelf life [19]. With the application of Nanocoating-konjac it is hoped that post-harvest

losses can be reduced, quality is maintained, and the shelf life is longer. Siamese oranges that do not meet the grade can be used as magot animal feed so that they provide added value and increase people's income. . Maintaining the quality of fresh citrus fruit products is the duty and responsibility of all parties in reducing or suppressing postharvest losses [20]. Postharvest handling of Siamese oranges with the application of Nanocoating-konjac has better prospects and development opportunities. The use of konjac nanocoating as a preservative for Siamese oranges can support community service goals in higher education, namely providing solutions based on situational analysis according to needs, challenges or problems that exist in society [14]. Therefore it is necessary to develop postharvest handling with several improvement efforts with the application of Nanocoating-konjac to maintain quality and extend the shelf life of Siamese oranges[6]. Aspects of product quality and shelf life need to be studied for business development and product marketing. With the problem of the postharvest handling process of Siamese oranges, it is necessary to apply the basic feasibility of GMP (Good Manufacturing Practice) and SSOP (Sanitation Standard Operating Procedures) in order to produce quality Siamese oranges with a long shelf life [8].

The implementation of this activity had the impact of increasing the knowledge and skills of group members in postharvest handling and marketing of Siamese oranges. In the post-harvest handling process, the type and quality of the raw material for Siamese oranges greatly influence the success of the application/coating process. Before carrying out activities based on the results of the pre-test, all group members need training on post-harvest handling and marketing of Siamese oranges. All of them have never done postharvest handling of Siamese oranges so that the shelf life of Siamese oranges does not last long. The group also did not know the benefits of applying the nano-coating which resulted in Siamese oranges being sold without being processed first. All group members do not have a method and do not know how to preserve Siamese orange products. Of the 20 group members who were present during the activity, 14 people (70%) had never preserved Siamese oranges, only 6 people (30%) had preserved them (presented in Graph in Figure 2, 3). After carrying out this activity, all members understood the material and the practices being carried out and the members chose to continue applying nano-coating to citrus fruits according to what was practiced and marketed them (presented in the graph in Figure 4). By utilizing the application of nano-coating on citrus fruits and packaging that is suitable and attractive, it can increase the selling value of citrus fruits and become a source of income for the KWT group [4].

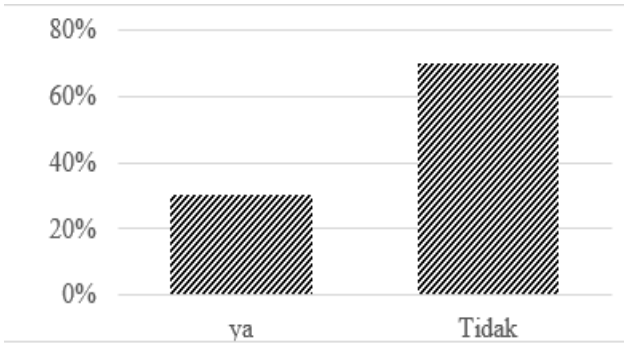

Fig. 2. Graph of Members Who Have Preserved Siamese Oranges

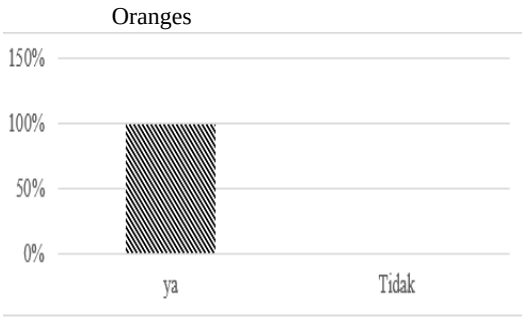

Fig. 3. Graph of Improved Understanding After the Implementation of Counseling

Fig. 4. Documentation of community service activities

This success is measured by observing the results of the work, observing the results made by the participants. Observation activities are carried out during community service activities and also after activities. After community service, observation is carried out through monitoring by tutors and training implementers

4. CONCLUSION

Community service activities have been running smoothly. Community service regarding the afterharvest of Siamese oranges can have a significant positive impact on society, especially in terms of economic empowerment and improving product quality and the shelf life of Siamese oranges. The results of community service showed that of the 20 group members who took part in the activity, 70% had never preserved Siamese oranges, only 30% had preserved Siamese oranges in a simple way. After carrying out these activities, all members understand the material and practices carried out. By utilizing the application

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of konjac nanocoating coating on citrus fruits, it provides added value and becomes a source of income for the community. The public can update the packaging of citrus fruits that have been applied with konjac nano-coating to make it look more attractive and increase the selling value.

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REFERENCE

[1] A. K. Marantika, N. N. D. Martini, and ..., "Pendampingan Penyusunan Strategi Pengembangan Desa Wanagiri Sebagai Desa Wisata," Proceeding …, pp. 431–440, 2020, [Online]. Available: https://lppm.undiksha.ac.id/senadimas2020/assets/ProsidingSenadimas2020/file/56.pdf

[2] R. F. Rauf, R. Fadilah, and A. A. Rivai, "Program Edukasi Penanganan Pascapanen untuk Meningkatkan Nilai Jual Jahe Merah (Zingiber officinale var . Rubrum) di Desa Pao Kecamatan Tombolopao Kabupaten Gowa," vol. 23, no. 1, pp. 22–26, 2021.

[3] L. Suriati and K. Selamet, "Empowerment of PKK Wanagiri Group through the Application of Natural Preservative Aloe-coating on Strawberries," vol. 6, no. 3, 2022.

[4] Wahyu Tjiptaningsih, "Pemberdayaan Perempuan Dalam Upaya Peningkatan Ekonomi Keluarga (Studi Kasus Pada Kelompok Usaha Perempuan di Desa Sindangkempeng Kecamatan Greged Kabupaten Cirebon)," Reformasi J. Ilm. Adm., vol. 1, no. 2, pp. 28–35, 2017.

[5] H. A. Sanaky and F. Nashori, "Peningkatan Dan Pengembangan Produk Olahan Kopi Di Desa Brunosari," AJIE-Asian J. Innov. Entrep., vol. 03, no. 03, pp. 2477–3824, 2018.

[6] L. Suriati, "Nanocoating-konjac application as postharvest handling to extend the shelf life of Siamese oranges," vol. 7, p. :1104498., 2023, doi: doi: 10.3389/fsufs.2023.1104498 COPYRIGHT.

[7] S. B. Sulistyo et al., "Color-based analysis for non-destructive quality evaluation of siamese orange (citrus nobilis) during storage in room and cold temperature," IOP Conf. Ser. Earth Environ. Sci., vol. 406, no. 1, 2019, doi: 10.1088/1755-1315/406/1/012004.

[8] L. Suriati et al., "The Development of Taro Processed Product in Women Farmers Group in Baru Village, Tabanan Bali Indonesia," AJARCDE | Asian J. Appl. Res. Community Dev. Empower., vol. 6, no. 1, pp. 28–34, 2022, doi: 10.29165/ajarcde.v6i1.83.

[9] L. Suriati, L. K. Datrini, and I. N. Rudianta, "Development of Taro-based Products in the Dewi Catur Women's Farmer's Group, Catur Village Kintamani Bali," Asian J. Adv. Agric. Res., vol. 18, no. 3, pp. 1–8, 2022, doi: 10.9734/ajaar/2022/v18i330221.

[10] N. N. Darsini, I. M. Sudana, I. D. N. Suprapta, and D. N. Nyana, "Exploring antagonistic candidate fungi for controling pathogenic fungi (colletotricum gloeosporioides) causing anthracnose disease in kintamani siam orange plants (citrus nobillis lour var. hass)," Int. J. Adv. Sci. Eng. Inf. Technol., vol. 7, no. 1, pp. 269–275, 2017, doi: 10.18517/ijaseit.7.1.1919.

[11] F. Donsì et al., "Green beans preservation by combination of a modified chitosan based-coating containing nanoemulsion of mandarin essential oil with high pressure or pulsed light processing," Postharvest Biol. Technol., vol. 106, pp. 21–32, 2015, doi: 10.1016/j.postharvbio.2015.02.006.

[12] L. Suriati, "Nano Coating of Aloe-Gel Incorporation Additives to Maintain the Quality of Freshly Cut Fruits," vol. 6, no. June, pp. 1–15, 2022, doi: 10.3389/fsufs.2022.914254.

[13] L. Suriati, I. M. S. Utama, B. A. Harsojuwono, and I. B. W. Gunam, "Effect of Additives on Surface Tension, Viscosity, Transparency and Morphology Structure of Aloe vera Gel-Based Coating," Front. Sustain. Food Syst., vol. 6, no. February, pp. 1–9, 2022, doi: 10.3389/fsufs.2022.831671.

[14] Y. Ma, K. Ye, P. Liu, A. Yuan, S. Chen, and Y. He, "Effect of a Konjac glucomannan/chitosan antibacterial composite membrane microencapsulated with oregano essential oil on the quality of chilled pork," Appl. Food Res., vol. 3, no. 1, p. 100249, Jun. 2023, doi: 10.1016/J.AFRES.2022.100249.

[15] M. Zhang et al., "Evaluation of the composition of konjac glucomannan on the color changes during the deacetylation reaction," Int. J. Biol. Macromol., vol. 228, pp. 242–250, Feb. 2023, doi: 10.1016/J.IJBIOMAC.2022.12.156.

[16] M. Xiao, L. Luo, B. Tang, J. Qin, K. Wu, and F. Jiang, "Physical, structural, and water barrier properties of emulsified blend film based on konjac glucomannan/agar/gum Arabic incorporating virgin coconut oil," LWT, vol. 154, p. 112683, Jan. 2022, doi: 10.1016/J.LWT.2021.112683.

[17] S. Galus et al., "The Effect of Whey Protein-Based Edible Coatings Incorporated with Lemon and Lemongrass Essential Oils on the Quality Attributes of Fresh-Cut Pears during Storage," 2021, doi: 10.3390/coatings11070745.

[18] E. F. Islamiati, Y. A. S. Anwar, and A. Hakim, "Pengembangan Petunjuk Praktikum Kimia Bahan Alam Tentang Isolasi Sinamaldehid dari Kayu Manis," Chem. Educ. Pract., vol. 3, no. 2, p. 104, 2020, doi: 10.29303/cep.v3i2.2006.

[19] C. O. Adetunji et al., "Effects of edible coatings from Aloe Vera gel on quality and postharvest physiology of Ananas Comosus (L.) fruit during ambient storage," Glob. J. Sci. Front. Res. Bio-Tech Genet., vol. 12, no. 5, pp. 5–10, 2012.

[20] R. Zeng, A. Zhang, J. Chen, and Y. Fu, "Impact of carboxymethyl cellulose coating enriched with extract of Impatiens balsamina stems on preservation of 'Newhall' navel orange," Sci. Hortic. (Amsterdam)., vol. 160, pp. 44–48, Aug. 2013.