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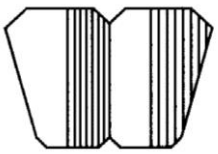
Annual Report on Research Activities

Abstracts in English



2017

Kyoto Prefectural Rakuhoku High School

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Physics&Geology

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The Future of Welfare Design – Leading Tomorrow's Japan Through Dialogue with Virtual Future Generations

Koichi Ashida, Haruka Nishimura, Miyuka Ota

Abstract

One of the current problems in Japan is the fast-growing ultra-aging society. We need to overcome this problem by constructing a proper welfare system. The purpose of this study was to suggest policies that would help construct a welfare system that enables us to sustain ourselves even in the future. First, we studied documents about the current system of elderly welfare and pensions. Then, we highlighted the problems and discussed them by setting up a "virtual future generation", who pretended to be a generation several hundred years in the future.

As a result, in the field of elderly welfare, we constructed policies aimed at the decentralization of universities and companies, the improvement of healthcare services and making labor more efficient with AI technology. Meanwhile, in the field of the pension system welfare, we constructed policies aimed at promoting salaries, increasing the national budget for the pension system, and developing a pension system from the point of view of current climbing costs of living. According to this research, we thought we could decide policies more concretely by reviewing discussions with virtual future generations. This concept can be applied to other problems such as lack of resources or overpopulation. With this idea, we will be able to construct a sustainable society.

Keywords: Welfare system, Pension, Virtual Future Generation, Future Design

The Future of Urban Forests: A Comprehensive Matured Tree Survey in Kyoto

Harada Shusuke, Umezawa Ryoga, Yasuoka Yuto

Abstract

These days, due to the progression of urbanization and deforestation, retaining intact forests in cities is becoming an important issue. Such forests play an important role in protecting wildlife and providing people with places for learning about nature. Therefore, it is essential to scrutinize their actual situation and contemplate the best ways to conserve them. In this research, we investigated the current situation of solitary forests in Kyoto city, and proposed a better way to manage them. We visited Inochinomori Forest and Tadasunomori Forest, located in Kyoto, 6 times from 10/14/2017 to 11/19/2017, and surveyed the vegetation of each forest through measuring matured trees and some young trees. As a result, we found that dominant species in the former forest are *Zelkova Quercus serrata, Cerasus jamasakura,* while the dominant species in the latter forest are *Camphor, Celtis*, and *Aspera*. Also, results of our vegetation research indicates that *Lingustrum lucidum* will increase in population both in Inochinomori and Tasasunomori, meaning that exotic species pose a threat to domestic plants. Furthermore, the fact that young trees are seen less frequently in Tadasunomori infer the possibility of their decline in the future.

Keywords: **Inochinomori, Tadasunomori, Kyoto, Urban Forest, Tree Survey**

Make Kyoto Again：
Using Regional Kyoto Culture to Advance Kyoto's Cityscape

Tani Atsushi, Motobe Tsumugi, Suma Yuina, Kawanishi Zeroharu

Abstract

Japan is changing to becoming a modern urban landscape that emphasizes convenience. Based on the opinions of teenager, we found and proposed necessary elements for the landscape of Kyoto, Japan.

In a questionnaire completed by students of Rakuhoku High School, we found that students believed it to be important to "unify the color of buildings" and "incorporate the features of the region into city planning". Also, there was an opinion wanting to set up more trash cans in public, which emphasizes convenience. In regards to city planning in Kyoto, we found that a regional-based proposal that incorporates regional characteristics and that also considers convenience is necessary. This research will help to decide the policy of developing Kyoto. For example, in the case of the Awata school district in Kyoto, we reviewed the design of trash cans and the number of their installations, and thought of city planning ideas such as eliminating signboards.

Keywords: Landscape, Kyoto, City Planning,

Differences in Manner Awareness Between Local Residents and Tourists of Kyoto

Honoka Minami, Yui Mitsui, Arisa Nakamura, Syunsuke Nogami

Abstract

Kyoto gets lots of visitors from all over the world, so they are closer than before to us. However, there are sometimes frictions between Japanese people and tourists from abroad because every country has their own culture. In this study, we researched ways to make a comfortable city for people living in Kyoto and foreigners visiting. Students of a Kyoto-based high school, and foreign tourists who came to Kyoto were asked to complete a questionnaire. Also, we interviewed our Assistant English Teachers, foreigners who now live in Kyoto. As a result, we found that we should explain Japanese manners in detail to foreign tourists. For example, we do not need to open taxi doors by ourselves because taxi doors open automatically. In addition, it is important that we understand the differences in manners between Japan and other countries and compromise with one another because these frictions are merely caused by a lack of understanding.

Keywords: Manner, Tourists, Kyoto, Sightseeing

Regarding the Definition of Non-natural-number-order Derivatives

Sei Asano

Abstract

Although natural-number-order derivatives are well-defined recursively, non-natural-number-order derivatives are not and it is impossible to define them so that they have the same behavior as natural-number-order derivatives, so I tried to define non-natural-number-order derivatives reasonably without making a contradiction. By adopting some of the properties of natural-number-order derivatives, I was able to define non-natural-number-order derivatives, not generally, but of considerably many regular functions. The definition is not the same as generally accepted theory, but it is worth being accepted as another possible way.

Keywords: **Derivative**

Real-number-order derivatives

Tokihiro Fushimi, Yutaro Oka

Abstract

Using extension of a function of both power and Fourier series, we tried to define real-number-order derivatives by extending natural-number-order derivatives. In the extension of a function of a power, we ordered real-number-order derivatives that use the general form of a factorial. However, there was a contradiction between the two methods when we compared the equation that differentiates e^x using the Maclaurin series and using the special nature of the derivative of e^x. In the extension of the Fourier series, by using real-number-order derivatives of $\sin(ax+b), \cos(ax+b)$ and Fourier series, we defined real-number-order derivatives of a periodical function whose period is $2l$. We found that the real-number-order derivative of e^x is e^x in the range of $-l < x < l$.

Keywords: **Fourier series, Factorial, Maclaurin series, Periodical function**

Inversion in Three Dimensions with Demonstration of the Arbelos 2-sphere

Jin Higashitani

Abstract

I defined the arbelos 2-sphere as a 2-sphere inductively meeting four chosen 2-spheres and I found the movement of their points of contact with their inversion in three dimensions. My hypothesis was that the points of contact define a circular locus. I used a feature of inversion in three dimensions which is that a 2-sphere turns into another 2-sphere or a plane, while a plane turns into the same plane or a 2-sphere in order to confirm my hypothesis. And I proved that inversion in 3D can maintain the relationship of contact points between two functions after inversion. As the result of the experiment, my hypothesis was partly incorrect. When it comes to the arbelos 1-sphere, its contact point draws a circular locus. The arbelos 2-sphere, however, has six contact points on the circle and they can form a regular hexagon. Additionally, when I conducted the experiment in addition to it, I found a definition that makes a circular locus by changing the first definition a little. In conclusion, I was able to show that the contact points of arbelos spheres obey different rules in increasing dimensions.

Keywords: Arbelos 2-sphere, Inversion, Locus

Facial Expression Recognition Using a Support Vector Machine (SVM), Binarization and Edge Detection

Rito Yasuoka

Abstract

The purpose of this study was to make a computer distinguish automatically whether people in pictures are smiling or not. By doing so, we can classify images automatically and find smiling images in many images. We used ten thousand images. First, we calculated the threshold for one picture using the discriminant analysis method and made binary images. Second, we made edge images using the Laplacian filters. Third, we used binary and edge images for the teacher data, and we made the computer learn whether the people in the pictures were smiling or not by using the support vector machine (SVM). We used the linear kernels, and set the value of the regularizing parameter C to 5.0, 0.5, and 0.1 and compared each case. The value of the recall ratio, the precision ratio and the F value of the smiling images were high, but there was no difference between using black-white or using edge detection. However, the precision ratio and the F value of all of the non-smiling images were extremely low, so it can be said that the computer can't distinguish smiling and non-smiling images perfectly.

Keywords: **Facial Expression Recognition, Binarization, Discriminant Analysis method, Edge detection, Support vector machine**

Estimating the Length of Time Required to Stop Axisymmetric Rotational Flow by Attenuation Using a Mathematical Model

Kanon Shimizu

Abstract

I estimated the length of time needed to stop axisymmetric rotational flow by using a simple mathematical model. The mathematical model was constructed by combining Couette flow and axisymmetric rotational flow. In order to estimate the consistency between the mathematical model dealt with in this research and the actual flow, I conducted an experiment to compare predicted flow with the actual flow. As a result, the mathematical model dealt with in this research can be expected to be a good model for use in estimating the time required for axisymmetric rotational flow to stop.

Keywords: **Fluid dynamics, Axisymmetric rotational flow, Couette flow, Mathematical model**

Removing Raindrops from a Windshield with Ultrasonic Waves

Takagi Kosuke

Abstract

Ultrasonic sound waves are being used in various ways. I focused on investigating ultrasonic levitation. The investigation was to find out whether ultrasonic waves can remove raindrops from the windshield of cars instead of wipers. I used a device which generates ultrasonic waves and used acrylic plates as a windshield. First I successfully levitated a piece of finely smashed foamed styrol. But spherical resin did not float. Then, instead of removing raindrops by levitation, I decided to remove to them from adhering glass. When the spherical resin fell, it caused streaks. Also when reflector were loaded to it, the streaks coincidentally moved. Finally, I researched using water drops in the same way, but I wasn't able to obtain pleasing results because of their surface tension and inadequate output of the ultrasonic device. In accord with these studies, I'm going to examine further methods to apply ultrasonic waves, and consider how to better remove raindrops.

Keywords: Ultrasonic, Spherical resin, Ultrasonic sounds waves

AI Growth – An Evaluation of Changes in AI Behavior with Differing Connect 4 Board States

Renon Onoe

Abstract

I considered designating an AI's behavior and strengths by searching for a method to evaluate Connect 4 board states, the behavior of AI due to differences in data quality, and changes in winning percentage. I performed the experiment by using two evaluation methods which used recorded game data and various board states. As a result, it was confirmed that the winning percentage rose due to the difference in the evaluation methods and there are board states to which the AI's following movements are unified- that is, the AI made a standard move. In conclusion, I expect that manipulating trends of tactics and strength of an AI could be realized by further research in the future through such methods.

Keywords: **AI, Connect 4**

Seeking the Best Mixture Ratio of Nutrients for Fertilizers

Yuiko Abe, Yuwa Goto, Naomi Hirose

Abstract

All plants need fertilizer and each fertilizer's nutrient ratio is original. There are two main kinds of fertilizer; either organic or inorganic. Multiplier effects and weakening effects can affect plant growth. Taking these effects into consideration, we decided to grow white radish sprouts in hydroponic culture to seek the fertilizer nutrient ratios in which sprouts grow best (where leaves are bigger and have fewer wrinkles). We used KNO_3, $NaH_2PO_4 \cdot 2H_2O$, H_3BO_3, $NaCl_2$, $MgCl_2$, $CaCl_2$ in our fertilizer. We divided sprouts into groups, and gave each group different combinations and concentrations of the substances supplemented in the fertilizer. As a result, the best nutrient ratio in our experience was N:P:K:B:Mg:Ca=400:266:400:5:40:3(mol). Also, we were able to confirm the fact that multiplier effects exist between N and Ca.

Keywords: Nutrient, Fertilize, Ratio, Radish

Observations and Cue Experiments on Zebrafish Indicate that They can Predict Feeding

Ryuusei Iida, Kinjiro Takeda, Kazuma Yoshida

Abstract

Animals that human beings have been keeping as pets for a long time seem to sense it is feeding time before the food appears in front of them. Through daily observations and experiments, we examined what kind of cues zebrafish use to predict their feeding. The reason we used zebrafish is that they are easy to keep. They showed us various responses and we couldn't find a specific behavior pattern, but we derived a view that they may predict their feeding by the first stimulus that causes a break in the still environment, because they especially reacted after such a stimulus. We don't know why but regrettably zebrafish came not to eat the food, so we couldn't continue the experiments.

Keywords: **Zebrafish, Fish, Animal behavior, Memory**

How to Attract Termites: Eco-friendly Pest Control with *Houttuynia cordata*

Hibiki Seymura, Yuki Tanabe, Karin Yamaji

Abstract

Termites are like defensive cave men. They don`t come out when we want to let them out. Termites has been regarded as harmful insects, and we have long tried to kill them. Nonetheless, the pesticides we use today contain harmful chemicals, so not only termites but also we human beings are harmed or affected by them. So we tried to produce pesticides in an eco-friendly way. We heard that some substances in the chameolon plant *Houttuynia cordata* help to attract termites. First, we tried to extract materials from *Houttuynia cordata* which can evoke the reaction on termites with ethanol and hexane. And then, we tried to isolate them with chromatography and identify what they are with NMR (Nuclear Magnetic Resonance). Finally we were certain that 2-Undecanone and 1-nonanol was in the liquid isolated and that they were involved in attracting termites.

Keywords: **Termite, *Houttuynia cordata*, Chameleon plant, Pesticde**

An Investigation of Drug Resistance Through Culturing *E.coli*

Ryunosuke Nakagawa, Yuki Nakano, Nanako Uchida

Abstract

In this study, in order to investigate drug resistance, we did an experiment giving ampicillin to *E.coli* which do not confer resistance to it. We then picked and re-culture the colonies which had survived under that condition. As a result, the E.coli colonies showed high resistance to ampicillin compared to normal. Thus, it can be said that we were able to culture drug-resistant bacteria through this experiment. Therefore, we were sure that drug resistance bacteria can easily appear because of human behavior.

Keywords: **E.coli, Drug resistance, Antibiotics, Bacteria**

Changing the Intestinal Environment Using Plant *Lactobacillus:* The Magic of "*Tsukemono*" (Japanese Pickles) in Kyoto

Yuriko Akima, Miku Asada

Abstract

We took an interest in the *Lactobacillus*' function of improving the intestinal environment. *Lactobacillus* is found in pickles.

In order to find efficient pickles for setting the intestinal environment using *Tsukemono,* a food specialty of Kyoto, we nurtured *Lactobacillus* found in pickles, observed the colonies formed and examined the pH changes of its culture medium. By consuming *Tsukemono*, we know that *Lactobacillus* oxidizes the environment around it, reduces the amount of "bad" bacteria, and increases the amount of "good" bacteria.

According to the result, we found that *Shibaduke* contains the most *Lactobacillus* and *Suguki* contains the least. Lightly-pickled vegetables, such as *Harihariduke*, do not contain a lot of *Lactobacillus*, of which their fertility rate is low.

We observed the pH in the culture medium before and after culturing *Lactobacillus*, and found that Suguki has the strongest oxidizing power.

Keywords: **Lactobacillus, Pickles, Intestines, Oxidization**

Zebrafish's Memories of Left and Right

Tatsuki Konaka, Yuki Sasaki, Hikari Shimizu

Abstract

In general, fish are not considered to be good at memorizing. However, we had some doubts about that opinion, so we decided to examine how much they can remember which is left or right. We used zebrafish (*Daniorerio*) as a model system for these experiments. We made a vat and measured the required time for the zebrafish to move from the start space to eat the feed placed in the "goal" space, located at the right side of the T-junction. We repeated these experiments once a day. Through these experiments, though the required time was decreased, we could not find out whether the zebrafish could memorize if there was feed on the right side. Nevertheless, we did find that zebrafish can become habituated to heavy handling and once they have experienced being handled, they seemed to be calm even in different situations.

Keywords: **Zebra fish, Left and right, T-junction**

Observing the Power of Protease on Fruits Through Electrophoresis

Rio Miki, Ayumi Ohashi, Yuki Ueda

Abstract

We were interested in the size of proteins, so we decided to observe it through electrophoresis. It is known that proteases break down proteins, so we expected that proteins broken down by proteases will become smaller in size. We supposed that if we conducted this study through electrophoresis, we will be able to figure out the function of proteases. We observed how proteins in chicken meat can be broken down by proteases. It is known that many fruits contain proteases. In this study, we performed electrophoresis through SDS-PAGE on proteins before and after adding proteases. We used fruits high in proteases such as pineapples, kiwis, and papaya for our experiments. The time and temperature for pickling chicken meat, the size of each meat, and the kind of fruits used for pickling the meat were different from each other in our three experiments. As our results, we found that the longer we pickled meat in each fruit and the larger surface area that the meat had, the tenderer the meat became. We also found through investigation, that kiwi is the best fruit to decompose proteins compared to other fruits which contain proteases. According to these results, we found that the best way to make meat tender is to pickle the meat for as long as possible, and have a large surface area, and that, in particular, kiwis are the most effective fruits in cleaving meat proteins.

Keywords: Protease, Electrophoresis, Protein

How to Kill Mosquitoes –pH Resistance of Mosquito Larvae

Kentaro Goto, Shin Inokawa. Kyoheu Kita

Abstract

Mosquitoes live around us, and they often do harm to us. Thus, in order to find clues to confirm a new control method of mosquitoes, we measured the resistance of mosquito larvae to extreme pH conditions, and compared this resistance with *Neocaridina denticulate*. Both of them are aquatic creatures and are easy to catch, so were appropriate experiment models.

As a result, mosquito larvae were able to survive in solutions ranging from pH 3.2 to 12.2 whilst *Neocaridina denticulate* were able to survive in solutions ranging from pH5.8 to 8.2. Extreme pH-resistance of mosquito larvae is fairly strong, much stronger than that of shrimp, which share the same aquatic life. Therefore, this led to the conclusion that it is in fact difficult to combat mosquitoes using extreme pH changes.

Keywords: **Mosquitoes, pH resistance, *Neocaridina denticulate***

Looking for a Secondary Rainbow! Using Glass Beads as a Substitute for Water

Amika Goda, Honoka Shiba, Mahoko Yoshi

Abstract

In this study, we used the characteristic that light reflects in glass beads, and we particularly tried to recreate the observation of a secondary rainbow which reflects twice in water droplets, using glass beads as a substitute for water droplets. As a result, we realized rainbows generated by sunlight can also occur when using glass beads. However, we realized the secondary rainbow occurs at around a 45°angle between the incident light from the sun, to the point that we could see a rainbow on the drawing paper with glass beads and the incident light on our eyes from the point of the occurring rainbow, As such, we were not able to conduct a practicable experiment.

Keywords: **Secondary Rainbow, Glass Beads, Rainbow**

Converting Solar Wind into Electrical Energy

Shin Fuji, Shota Onishi, Wataru Shinmi, Takahiro Waki

Abstract

The goal of our study was to convert solar wind into electrical energy. However, we can`t go to outer space and observe real solar wind. Therefore we thought of using a current which is made up of transferring the charge from solar wind and tried to extract the induced current from the solar wind's current by using coils. As a result, we were able to get an induced current by changing the shape of the coils. Also we found that the amount of induced current increases according to the number of windings and the surface areas of the coils. However, in the case of real solar wind, because charges in the magnetic field of solar wind are very weak, we conclude for now that it is difficult to get electrical energy this way.

Keywords: Solar wind, Electromagnetic induction, Coil

The Best Architecture That Lasts Long

Keigo Ikeda, Shou Nakazawa, Aoi Sugahara, Yuri Taguchi

Abstract

We sought for what sustainable architecture was like. We thought that it would be good if a building can last for 100 years or so without its floors being crumbled under the weight of the furniture. For this study, we paid attention to the insides of walls or floors and considered many possible constructions. We referred to the "honeycomb structure", which can be seen in bees' nests. (Besides aggregates of honeycomb columns, we also prepared those of equilateral triangles and squares.) Then, we applied force in various ways.

As a result, we found that when we put the structure vertically to the floor and applied force slowly, the honeycomb structure showed the best resistance of the three. (When we put it parallel to the ground, the equilateral triangle structure was the strongest.)

If the honeycomb structure is applied to the construction of walls or floors in this way, the architecture would be able to resist heavy furniture for many long years.

Keywords: Honeycomb structure, Architecture

Verification of the Effects of Amides as a Habit Modifier on NaCl

Sou Fukui, Shota Sasada

Abstract

Habit modifiers are known as substances which can change the form of a crystal. Formamide is known as a habit modifier which changes the hexahedral crystal of NaCl into an octahedral crystal structure. In our study, we used urea as a habit modifier. We created deformed NaCl crystals by evaporating aqueous NaCl using different concentrations of habit modifier. We investigated the relationship between the concentration of urea and the size and structure of the NaCl crystal. As a result, the more urea there was, the more octahedral crystals were formed. The hexahedral NaCl crystal became smaller as the concentration of urea decreased. In contrast, the size of the octahedral crystal didn't change. This result shows that hindering other sides' growing with a habit modifier can restructure the crystal. By comparing the effects of urea and formamide, urea was more effective than formamide at changing the crystal structure of NaCl. Urea was also more effective than glycine. So we suggested the possibility that the strength of each habit modifier's effect is dependant on the molecular structure of the habit modifier itself.

Keywords: **NaCl, Habit modifier, formamide, Urea, Crystal**

Shell Morphology of *Corbicula japonica*

Natsuki Adachi, Wakana Kaneda, Ayane Nanjo

Abstract

In order to find ways to learn about the habitats of fossilized shells, our group conducted research on *C. japonica* in five areas of Japan based on our hypothesis that the higher the latitude of its habitat, the rounder its shell form is. We measured the size of the shells and compared all the data in the production area. As a result, we found that forms of *C. japonica* are not connected with latitude, fast growing *C. japonicas* are vertically longer, and some habitating in Shinji Lake are more round than those that live elsewhere. Therefore, we presumed the reason why *C. japonicas* of Shinji Lake are round is that it is difficult for them to grow flat because of high population density.

***Keywords:* *Corbicula japonica*, Morphology, Shell**

The Stickiness of Natto has Hidden Potential in Improving Water Quality with Natto-derived PGA

Tomohiro Kawakami, Kohei Mori, Miyu Tanabe

Abstract

PGA (polyglutamic acid), found as a natural substance in natto, is one of many polymerization flocculants which aggregates suspended solids in suspension. There have already been many experiments about PGA's aggregation effect, but most of them have not clearly found the amounts of PGA and how to use it. In order to unravel the qualities of PGA and make it easy to use, we put various concentrations of PGA into suspension and observed any differences in its aggregation effect. Moreover, we mixed $Ca(OH)_2$ together with PGA into suspension and observed whether the suspension became clearer compared with when using only PGA. However, the result was almost the same. From this result, we can guess that $Ca(OH)_2$ might raise the pH so that PGA denatured and lost its aggregation effect. Therefore, in order to find the aggregation effects of PGA or $Ca(OH)_2$, we should use inorganic flocculants which do not affect pH.

Keywords: PGA, Natto, Polymeric flocculants, Inorganic flocculants

Disinfectant and Antibacterial Properties of Household Spicy and Fragrant Ingredients

Sakura Azuma, Ayane Kitada, Ryosuke Kuroda, Miho Sakiyama

Abstract

Many people in developing countries have issues with their water. A cause of this issues can be attributed to pathogenic organisms. There are pathogenic organisms in the drinking water in many African and Latin American countries, as well as Indonesia, India, and Turkey. It is said that the spicy components of foods can cause sterilization. Therefore, we conducted an experiment to examine the antibacterial properties and the power of the disinfectant effects of garlic, ginger, vinegar, shiso, mustard, houji tea, genmai tea, oolong tea- common household ingredients. Through our experiment, we found that garlic, ginger, shiso and vinegar were very effective in making safe drinking water. These four ingredients were so effective that we had to use very little amounts of the extract to sterilize the water, such that the sterilized water was odorless. Taking into consideration the habitat of these ingredients, garlic and mustard is naturally grown in Central Asia and ginger in South-East Asia. As for vinegar, it is made from rice so Africa and South-East Asia, where rice is grown, can easily produce it for use as a disinfectant and antibacterial substance.

Keywords: Antibacterial, Disinfection, Water sterilization

Let's Make Artificial Soil for use in Space: Growing Plants with Polyurethane Foam

Yuto Asai, Akane Makino, Ruri Naito, Mahiro Okumura

Abstract

In our research, we made artificial soil such that plants could be grown in space. We defined artificial soil as polyurethane foams including polymer particles in order to improve its water suction power. The purpose of this experiment was to compare the growing patterns of leaf mold grown with polyurethane foam. Our hypothesis was that the softer polyurethane was, the more plants will grow. In actuality, there was no relationship between the growing levels and the degree of the softness of polyurethane. Next, we made sponges with different grains contained in them. We could not find any relationship between grain size, water absorption amount, and plant growth condition. However, the plants grew equally as well as ones raised with natural mulch. Thus, we succeeded in making artificial soil which could grow plants equally as well as natural soil.

Keywords: **Polyurethane, Artificial Soil, Polymer Particle, Leaf mold, Water Suction Power**

Let's Make Esters ~Fruit Scents Made with a Combination of Esters~

Nao Maeda, Aika Mukozono, Ayano Sawasaka

Abstract

We cannot know what substances are used to synthesize scents even we look at the labeling of ingredients. So, we made a decision to study the esters included in fruit scents. In this research, we made scents similar to fruits fragrances by reacting some esters together in order to identify what esters are contained in each fruit's fragrance. As a result, we succeeded in making a scent similar to strawberry syrup by mixing ethyl butyrate with methyl butyrate. However, we were able to mix only two kinds of esters together and we also did not dilute their concentrations sufficiently. Therefore, it is necessary for us to mix more kinds of esters and adjust their concentrations in order to re-produce more fruit scents.

Keywords: Ester, Scent, Fragrance, Fruits, Syrup

Synergistic Antioxidant Effects Between Catechin and Vitamin C

Yuna Kokaji, Yuto Ozasa, Yui Terada

Abstract

The purpose of this study was to examine whether catechin or vitamin C has stronger antioxidant powers and whether there is a synergistic antioxidant effect between them. We examined their antioxidant powers by measuring the absorbance of samples using the DPPH radical as a reagent. We found three key results. First, the discoloration concentration of the DPPH radical when used with catechin was between 0.02g/L and 0.08g/L, as was the case with vitamin C. Second, there was a direct proportional correlation between the antioxidant power and the concentration of catechin or vitamin C used. Third, there is a limit of the antioxidant power of catechin or vitamin C at a specific density. We could not find out however, whether there is a synergistic antioxidant effects between catechin and vitamin C.

Keywords: Synergistism, Antioxidant, DPPH radical, Catechin, Vitamin C