

Proceeding Book



GO GREEN2015 INTERNATIONAL POSTGRADUATE CONFERENCE ON GLOBAL GREEN ISSUES

"Incorporating Green Approaches for Resilient Future"

7 - 8 OCTOBER 2015 | Dewan Kuliah Al-Khawarizmi

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INDEX

		Page No.
Keynote Paper		
	<i>Ken Yeang Practice Report</i> Key Yeang	i
SECTION I: GREEN DESIGN CONCEPT		
Paper ID	Title of the Paper and Authors	
GR1001	<i>The Composition Of Usability Evaluation In Assessing Quality of the Display Case Lighting</i> Siti Norsazlina Haron, Norashikin Abdul Karim, Afzanizam Muhammad, Anuar Talib , Md Yusof Hamid	1
GR1002	<i>Usability Evaluation for Hospital Building Quality In-Use</i> Siti Norsazlina Haron, Md Yusof Hamid , Yuhainis Abdul Talib	7
GR1003	<i>The Green Adaptive Reuse of Historical Buildings</i> Kartina Alauddin, Mohd Fisal Ishak, Noorzalifah Mohamed	14
GR1004	<i>Industrial Building System; Does it good for sustainable building?</i> S.Roshanfekar, N.M Tawil, N.A. Goh	19
GR1011	<i>Book Transit Shelter : A Method in Developing a Zero-Waste Environment and Healthy Campus Community</i> Muhammad Naim Mahyuddin, Hafizah Mohd Latif, Muhammad Redza Rosman, Nor Sahidah Samsudin, Rafizah Mohamed Nordin	22
GR1015	<i>Green Concepts Through Shape-Grammar – The Language Of Intermediate Spaces In Traditional Malay Houses</i> Suzana Said, M. Sabrizaa Abdul Rashid, Rosmawati Mohamed, Neta Suredah Baharum, Izatul Asyikin Nordin	27
GR1017	<i>Characterization of Lime Plaster of Ipoh Royal Club for Conservation Purpose</i> Farah Reeza Abdul Razak, Siti Norlizaiha Harun	32
GR1018	<i>An Overview On The Typology Of Shophouses' Façade At The Heritage Area in Ipoh City</i> Wan Nordiana Wan Ali, Nurul Huda Abdul Hadi, Noor Rizallinda Ishak	38
GR1019	<i>Sustainability Of Building Elements In Bidayuh Traditional Longhouse Construction</i> Janet Victoria, Siti Akhtar Mahayuddin, Wan Akmal Zahri Wan Zaharuddin, Siti Norlizaiha Harun, Balkhiz Ismail, Noorsaidi Mahat	45

GR1021	<i>Ephemeral Architecture: In Between Permanence and Impermanence towards Sustainable Architecture.</i>	51
	Sayed Muhammad Aiman Sayed Abul Khair, Ismail Samsuddin	
GR1022	<i>In Search of Malay Landscape Design: Characteristic and Identification of Traditional Landscape at Sungai Perak</i>	58
	Mohd Khazli Aswad Khalid, Mohd Sabrizaa Abd Rashid ,Ahmad Zamil Zakaria	

SECTION II: GREEN TECHNOLOGY

Paper ID	Title of the Paper and Authors	Page No.
GR2001	<i>New Environmentally Lightweight Building Materials from Hybrid Inorganic Polymer-Wood Particles</i>	66
	Siti Noorbaini Sarmin	
GR2004	<i>Hybrid Technology for the use of Solar Energy: The Challenge towards Green Energy</i>	72
	S. I. Hossain, M. R. Al-Mamun, S. Sikdar, M. Al-Amin, S. C. Majumder, M. R. Hasan, M. Z. H. Khan	
GR2006	<i>Waste Management Practices and Recycling Intention among Undergraduates Students in Higher Learning Institution</i>	79
	Siti Fahazarina Hazudin, Anis Barieyah Mat Bahari, Alia Ezrie Ashiqin Jamaludin	
GR2007	<i>Thioflavin Dye Degradation by Using Magnetic Nanoparticles Augmented Polyvinylidene Fluoride (PVDF) Microcapsules</i>	83
	Mohamed Syazwan Osman, KaMan Kong, Boon Seng Ooi, Bassim H. Hameed, Jit Kang Lim	
GR2013	<i>Concrete Compressive Strength Development when Polyethylene Terephthalate Partially Replaces Sand</i>	87
	Muhammad Redza Rosman, Norishahaini Mohamed Ishak	
GR2015	<i>Evaluation of Laser-Printed Paper Deinking Quality Facilitate By Lipase and Esterase Enzymes</i>	95
	Nurul Shafika Azmi, Nik Raikhan Nik Him	
GR2016	<i>Green Approach in Road Construction</i>	102
	Suhaila Ali, Nurul Fatimah Yahaya , Norbaizura Abu Bakar, Mohd Hafiz Saberi, Norhafizah Yusop, Farhan Md Dahlan	

GR2017	<i>Establishing a Strategic Framework of Green Procurement for the Malaysian Construction Industry</i> MohdSallehuddin Mat Noor , Fadzil Hassan	108
GR2019	<i>Environmental Psychology: An Analysis on Lighting Efficiency of the Architecture Studio in UiTM Perak</i> Fazidah Hanim Husain, Zafuan Husri ,Farhah Amani	113
GR2020	<i>Effect of Kenaf Fibre and Rice Husk Incorporation on Melt Flow and Mechanical Properties of Calcium Carbonate/Polypropylene Hybrid Composite</i> Mohd Muizz Fahimi Mohamed, Rahmah Mohamed	119
GR2027	<i>Surfacing Effects on Thermal Condition in Urban Open Space</i> Liyana Ahmad Bazuli, Azhan Abdul Aziz	124
GR2028	<i>Impact Of Urban Block Configuration And Direction On Urban Temperature Increase In Hot, Humid Regions</i> Lin Yola, Ho Chin Siong	131
GR2029	<i>Modular Construction System in Malaysia: Issues for Research in Sustaining an Affordable Home Projects</i> Salmiah Aziz, Mohd Rofdzi Abdullah	140
GR2030	<i>Review on Indoor Environment Quality Parameters Towards Healthier Green Buildings in Malaysia</i> Fadhilah Che Aziz, Md Yusof Hamid	153
GR2032	<i>Green Solar Dehydrator</i> A. N. Alias, M. H. Khalid, N. F. M. Sahapini, Z. Mahfodz, F. Abdullah, R. Julius, M. A. Yahya, F. Fariesha	161
GR2035	<i>Solar Energy: Dilemma and the Way Forward</i> Norhafizah Yusop, Norbaizura Abu Bakar, Suhaila Ali, Mohd Hafiz Saberi, Mohamad Akmal Mohamad Najib, Noor Zawani Yusop	166
GR2037	<i>An Overall Thermal Transfer Value (OTTV) – Based Approach in Analysing the Energy Efficiency of Buildings: A Review</i> Afiqah Ahamad, Wan Abdullah Wan Alwi, Azman Zainoabidin	172
GR2040	<i>Natural Fibre as Fibrous Reinforced in Polymer Modified Mortar: A Review</i> Azamuddin Husin, Mahyuddin Ramli, Cheah Chee Ban	177
GR2042	<i>Flame Retardancy Study Of Recycled Polymeric Foam Filled Composite Building Material.</i> Syed Anas Syed Mustafa, Rahmah Mohamed, Lily Soraya Amerudin	184

GR2044	<i>Improving Overall Thermal Transfer Value of Office Tower Building in Malaysia. Case Study : Ministry of Women Family and Community Development, Lot 4G11, Putrajaya</i> Azman Zainoabidin, Amirul Amin Ismail	191
GR2045	<i>Towards Green Roads in Malaysia: Review of Road Characteristics Effects On Road Surrounding Microclimates with Respect to Roadside Trees</i> Nasibeh FaghihMirzaei, Sharifah Fairuz Syed Fadzil, Aldrin Abdullah, Nooriati Binti Taib, Reza Esmaeilifar	200
GR2049	<i>Carbon Footprint Calculator for Children</i> Romiza Md Nor, Haleeda Azwa Abdul Hadi	208

SECTION III: GREEN MANAGEMENT

Paper ID	Title of the Paper and Authors	Page No.
GR3001	<i>Project Manager Success Factors In Managing Green Buildings In Malaysia : Knowledge and Skills</i> Asniza Hamimi Abdul Tharim, Aifa Syazwani Zainudin, Nur'Ain Ismail, Thuraiya Mohd, Noor Aileen Ibrahim	213
GR3002	<i>Role of Real Estate Valuation Surveyors in the Malaysian National Taxation</i> Mohd Hasrol Haffiz Aliasak , Mohd Farid Bin Sa'ad	221
GR3003	<i>An Overview of the Challenges in Malaysian Green Construction</i> Asniza Hamimi Abdul Tharim, Aifa Syazwani Zainudin, Noraidawati Jaffar	228
GR3004	<i>Overview of Lean Issues in Managing the Green Construction Project</i> Wan Nur Syazwani Wan Mohammad, Mohd Rofdzi Abdullah	235
GR3005	<i>Identifying the Challenges in Obtaining Green Building Index (GBI) Certification In Construction Industry</i> Izatul Farrita Mohd Kamar, Lilawati Ab Wahab, Nor Suzila Lop, Noor Aishah Mohammad Hamdan	241
GR3006	<i>Stakeholder's Pressures on the Firm's Environmental Strategy in Malaysia</i> Rohati Shafie, Loke Siew Phaik	247
GR3007	<i>Key Success Factors of Green Building Implementation in Malaysia Construction Industry</i> Nor Suzila Lop, Asmalia Che Ahmad, Nik Aqlima Diyana Nik Zulkipli	254

GR3008	<i>The Effectiveness of the Implementation of QE/5S towards Quality Environment at Workplace</i> Norhaslina Jumadi, Nurul Sahida Fauzi, Lizawati Abdullah, Wan Nur Syazwani Wan Mohammad, Johana Yusof	363
GR3009	<i>Outsourcing Property Management Perspective: Universities in the District of Perak Tengah</i> Nurul Sahida Fauzi, Noratikah Kamarudin, Siti Nadiah Mohd Ali, Nor Aini Salleh, Noraini Johari	268
GR3010	<i>The Facilities Management Standard Service Category</i> Zuraihana Ahmad Zawawi, Wan Samsul Zamani Wan Hamdan, Nur Azfahani Ahmad, Nurul Fadzila Zahari	273
GR3011	<i>The Enhancement Criteria of Green Building Implementation For Property Development in Perak, Malaysia – Valuers’ Perspective</i> Roshdi Sabu, Hayroman Ahmad, Lizawati Abdullah	279
GR3014	<i>Preliminary Study on Waste Management for Implementation of Green Highway</i> Asmalia Che Ahmad, Nur Illiana Husin, Abdul Muhaimin Ab Wahid, Syahrul Nizam Kamaruzzaman	286
GR3016	<i>Critical Motivation Factors among Project Managers to Achieve Successful Project in Malaysian Construction Industry</i> Farhan Md Dahlan, Muhammad Amirul Fahme Ahmad, Siti Nadiah Mohd Ali, Siti Sarah Mat Isa, Norbaizura Abu Bakar	293
GR3018	<i>The Contractor’s Attributes For The Construction Project Success</i> Mohd Hafiz Saberi, Norbaizura Abu Bakar, Norhafizah Yusop, Suhaila Ali, Mohd Fisal Ishak, Farhan Md Dahlan, Noraini Abdul Rani	300
GR3020	<i>Review on Malaysia’s GreenRE in Comparison with Singapore’s GreenMark and UK’s BREEAM</i> Halmi Zainol, Fadhilah Che Aziz, Suharto Teriman, Haryati Mohd Isa, Muhamad Asri Abdullah Kamar	305
GR3021	<i>Risk Management Plan (RMP); Implementation and Challenges towards Sustainability and Green Concept for Public Projects in Terengganu</i> Yuhainis Abdul Talib, Siti Nirwana Mat Usof, Kharizam Ismail	311
GR3023	<i>Imperfection Of Tender Document: A Solution Towards Sustainable Construction Practice In Malaysia</i> Mohd Esham Mamat, Shahela Mamter, Mohammad Sani Mat Hussein, Norazlin Mat Salleh	318

GR3024	<i>Benefits of Green Building from Client's Perspective</i> Norazlin Mat Salleh, Nik Noor Hazleeda Baharuddin, Shahela Mamter, Mohd Esham Mamat	322
GR3025	<i>Green Material Procurement Implementation Towards The Green Buildings</i> Shahela Mamter, Siti Rohayu Jusoh, Mohd Esham Mamat, Norazlin Mat Salleh	328
GR3026	<i>A Review Of Ex-Mining Land Reclamation as Construction Project Activities: Focusing In City Of Ipoh</i> Mohd Najib Abd Rashid, Hayroman Ahmad, Siti Jamiah Tun Jamil, Noor Azam Yahaya, Mohamad Hamdan Othman	333
GR3027	<i>Repair and Maintenance Works For Low Cost Housing; Issues And Solution</i> Yuhainis Abdul Talib, Amirul Helmi Abdul Malik , Siti Norsazlina Haron	340
GR3028	<i>An Overview of Time and Cost in Arbitration for Construction Projects</i> Azira Ibrahim, Zulhabri Ismail, Thuraiya Mohd, Ida Nianti Mohd Zin	347

SECTION IV: GREEN CULTURE

Paper ID	Title of the Paper and Authors	Page No.
GR4002	<i>An Assessment of Carbon Footprint at UiTM Seri Iskandar Perak, Malaysia</i> Nor Izana Mohd Shobri, Wan Noor Anira Wan Ali @ Yaacob, Norizan Mt Akhir, Siti Rasidah Md Sakip	352
GR4005	<i>Eco-Friendly Food Packaging: Young Consumer 's Perception & Practice</i> Norsyamira Shahrin , Rabiatal Adawiyah Abd Rahman, Noorliza Zainol, Noor Saliza Salmi, Mohd Faisal Abdul Wahab	357
GR4006	<i>Ethico-Legal Issues In The Medical Profession: A Case Study Of Nursing Profession In The World</i> Lateef Wale Adeyemo, Syahirah Abdul Sukor, Amalina Ahmad Tajudin, Ali H Ali Beltamer	364
GR4008	<i>Green Perception and Behavior among Students at UiTM Melaka</i> Siti Norashikin Bashirun, Nurldayu Badrolhisham, Farah Shazlin Johari, Nurhafizah Mohd Zolkapli, Nor Maslia Rasli Samudin, NurFaithzah Jamian	373

GR4009	<i>Geographical Information Systems (GIS) Approach For Mapping The Aboriginal Children Malnutrition Growth : A Case In Kemar, Perak</i> Haslina Hashim, Izrahayu Che Hashim, Suzanah Abdullah, Fadhilah Md Isa, Noorfatekah Talib	378
GR4010	<i>A Preliminary Study of Cinemagraph as A Tool In Enhancing Public Service Announcement (PSA) On Smoking Habit Issue</i> Fahmi Samsudin, Rosita Mohd Tajuddin, Nik Ridzuan NikYusoff	388
GR4011	<i>Green Branding: The Effect of Green Trust towards Brand Loyalty of the Five-Star Hotel Guest</i> Muhd Nabil Hanif Hassim , Mohd Raziff Jamaluddin	394
GR4014	<i>Students' Knowledge in the Waqf Land Concept</i> Siti Nadiyah Mohd Ali, Rashidah Paujah Ismail , Abd. Halim Mohd Noor, Nurul Sahida Fauzi, Nor Nazihah bt Chuweni, Farhan Md Dahlan	400
GR4016	<i>The Awareness of Generation 'Y' on Green Building Development in Malaysia</i> Syarifah Nur Nazihah Syed Jamalulil, Haryati Mohd Isa, Nurul Huda Ahmad	405

SECTION V: GREEN ENVIRONMENT

Paper ID	Title of the Paper and Authors	Page No.
GR5001	<i>A Conceptual Study of Connectivity Elements Towards Successful Green Network</i> Nor Hamizah Abdul Hamid, Muhamad Ezran Zainal Abdullah, Nik Hanita Nik Mohamad	411
GR5006	<i>Sustainable Indicator for Feature Attributes Assessment of Urban Green Space</i> Rabi'ah Ahmad , Abdul Nassir Matori	417
GR5012	<i>Exploring the Relationship between Community Happiness and Environmental Setting</i> Siti Rasidah Md Sakip, Khalilah Hassan, Azran Mansor	425
GR5013	<i>The Potential of Lake in Generating the Urban Community Development. Case Study: Putrajaya Lake, Federal of Putrajaya.</i> Wan Noor Anira Wan Ali @ Yaacob, Norhafizah Abdul Rahman, Marina Abdullah, Nor Izana Mohd Shobri	433

GR5019	<i>Gis-Based Land Suitability Analysis Using AHP For Public Parks Planning In Kota Bharu, Kelantan</i> Khalilah Hassan, Izrahayu Che Hashim, Siti Syamimi Omar	439
GR5021	<i>Generating of Cotidal Dataset by Spatial Interpolation Techniques</i> Khadijah Sahdan, Syed Ahmad Qusoiri Syed Abdul Karim, Othman Mohd Yusof	446
GR5023	<i>Multiple Regeneration of Clinacanthusnutans Nodal Explants by using 6-Benzylaminopurine (BAP) Hormone</i> Siti Zulaiha Ghazali, Saiyidah Nafisah Hashim	451
GR5026	<i>Biodegradation of Petroleum Oil by using Isolated Penicillium sp.</i> Nabilah Razak, Saiyidah Nafisah Hashim, Chia Chay Tay	455
GR5030	<i>Students Awareness on Environmental Quality in Term of Daily Life Routine</i> Noorlida Daud, Wan Noor Anira Wan Ali @ Yaacob, Anwar Fikri Abdullah	460

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Green Solar Dehydrator

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Abstract

A solar drying system with portable design which consisting of different numbers of layer coated with aluminium foil was produced. This study was about using direct solar energy to dry food. From the information gathered from literature study, the prototype of several portable solar dehydrators with different number of layer coated with aluminium foil and the normal drying system was constructed and used in this experimental drying test. A portable solar dehydrator helps the food to dry faster and allow food to be better in quality. The earlier parameter for this solar dehydrator was the weight and followed with the percentage of the water loss. This portable solar dehydrator also can be used to dry the fruits. One major benefit of this dehydrator is its construction or design. It was simple constructed and was made with low cost materials. For all test conditions, the materials were dried with system efficiency of 60% to 78%.

Keywords: Solar, Portable, Dehydrator, Food, Low cost

1.0 Introduction

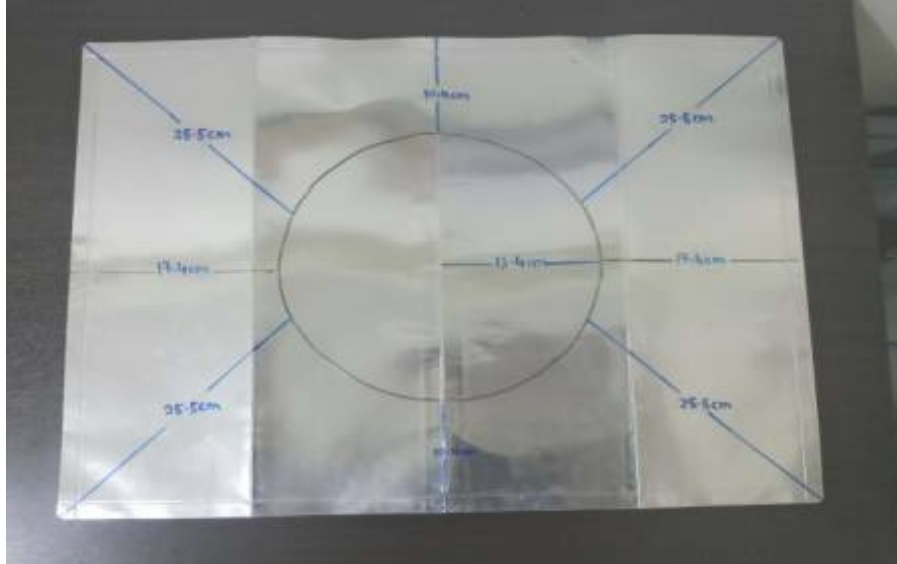
Solar energy is an abundant energy resource and has the radiant energy that is produced by the sun. Solar energy is referred to as the energy that comes from the sun's rays (Husted, 2007). The solar energy have many uses including heating a house, providing electricity and drying process. Drying by exposure to the sun is one of the oldest methods using solar energy for food preservation such as fruits and fish (Belessiotis, 2011). The solar energy is an important renewable energy that comes from the sun in abundance without paying for it like electricity. It is use for various purposes and one of the most essential uses of solar energy is in drying (Ltd., 2013). This drying concept is widely applied at sea sites. However, the normal drying system that was used does not give faster time for the food to be dry. By using a solar dryer, the drying time can be shortened by about 65% compared to sun drying (P.K.Wankhade, R.S.Sapkal, & V.S.Sapkal, 2012).

Hence, portable solar dehydrator is introduced to the solar drying system application. Portable solar dehydrator is the system that concentrated the sun light to give the best focus of the reflected light on the system and get the higher intensity of light than that of normal applications (P.K.Wankhade, et al., 2012). For the thousands of years, the solar energy is widely used to dry foods for short and long preservation (Sharma, Chen, & Lan, 2009). A direct exposure to the sun can also lead to over drying, insufficient drying and discolouring due to ultraviolet (UV) radiation (Böer, Holliday, & Kang, 2014). However, this method takes weeks for the foods to completely dry due to the temperature and humidity. This project is about to design the effective portable solar dehydrator by focusing on its design and the effect of the number of coated layer compared to normal drying system applications. This solar dehydrator is targeting to shorten the time taken for the food to dry. The reason of choosing this project is because the demand of green product is rising nowadays and to help people working with more efficient technique for food drying.

2.0 Methodology

The solar dehydrator was modeled as shown in Figure 3.1 below. The materials used in this project are aluminium sheet, velcrotape, aluminium foils, double tape and scissors. These are the step involved to produce the solar dehydrator model:

The aluminium sheet is measured according to the measurement as shown below



Then, the aluminium sheet is cut based on the line and measurement.

Stripe each of the cutted line of the aluminium sheet with velcrotape so that it will attached and become the shape as shown in figure 1.3 above.

There are 4 types of model were designed

The aluminium sheet only

The aluminium sheet coated with one layer of aluminium foil

The aluminium sheet coated with five layers of aluminium foil

Normal solar dehydrator which is by using net

The angle is adjusted to reflect the most sunlight is being analyzed by using the laser light. The laser light is turned and look straight down at the one farthest from the laser and see a shadow of the light. The laser lights are placed in each side of the polystyrene assuming that the position of sunlight is around the panel.

3.0 Result and discussion

Solar food drying system can be used in most areas but how fast the food dried was affected by many variables, especially the amount of sunlight and relative humidity. Typical drying times normally range from one to three days depending on the sun, air current, humidity and the type of food used to be dried. The concept lies behind the design of solar dehydrator.

Table 1.0: Percentage (%) water loss of fishes

Fish	Types of Solar Dehydrator	Initial Mass, M_i (g)	Final Mass, M_f (g)	$M_f - M_i$ (g)	Percentage of Water Loss (%)
A	Aluminium sheet	12.59	2.79	9.80	77.84
B		12.55	2.91	9.64	76.81
C	Aluminium sheet coated with one layer of aluminium foil	12.55	3.17	9.38	74.74
D		15.12	3.79	11.53	74.93
E	Aluminium sheet coated with five layers of aluminium foil	13.87	4.20	9.67	69.72
F		15.83	4.76	11.07	69.93
G	Net	12.20	5.01	7.19	58.93
H		11.33	4.60	6.73	59.40

Table 4.0 shows the recorded initial and final mass of fishes and their percentage of water loss from 10.00 am to 3.00 pm (5 hours). During the day when the experiment was conducted, the surrounding temperature was 30°C. The common name of the sample of fish used is *YellowstripeScad* or *SelaroidesLeptolepis* as listed in scientific name (Burke, (WRI), & Spalding, 2002). Based on the table, three types of portable solar dehydrator system were designed and one was from normal solar drying system. The first type was aluminium sheet, the second was aluminium sheet coated with one layer of aluminium foil, the third was aluminium sheet coated with five layers of aluminium foil and the fourth was the normal solar drying system which only used net. Two samples of fish were put on each of these types of solar dehydrator.

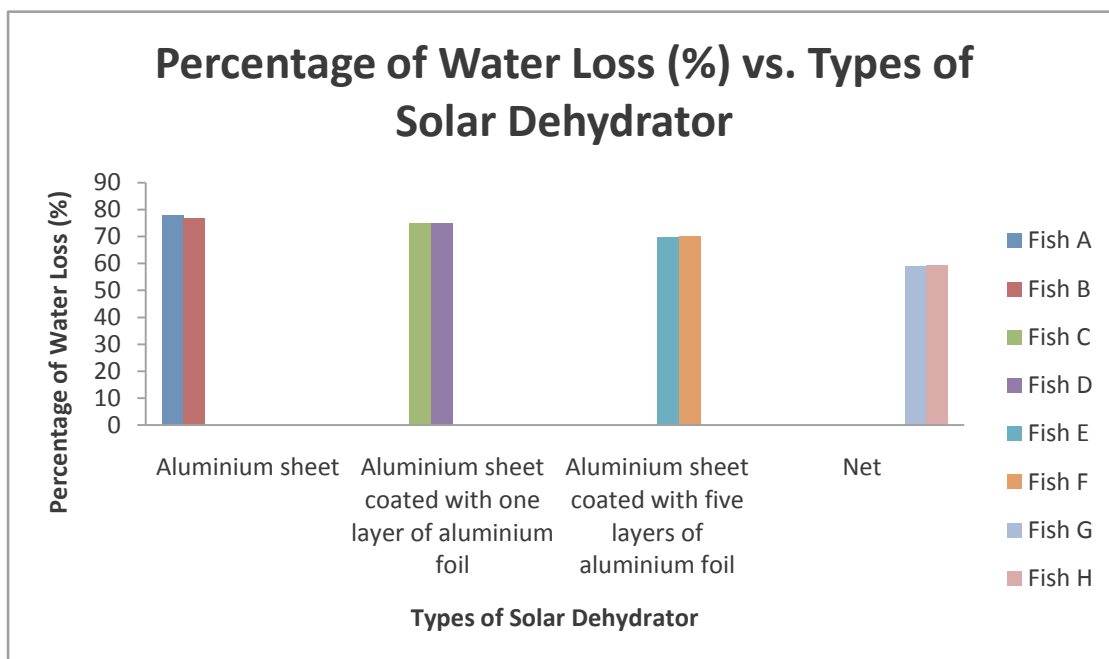


Figure 2.0: Graph of percentage water loss versus types of solar dehydrator

