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Aromatherapy and its Integration Through Renewable Energy

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Abstract

Albania is a part of Western Balkan Peninsula. Its geographical position allows the application and wide use of renewable energy, since it has about 308 sunny days per year. At the same time, the Mediterranean climatic conditions enable the growth and development of many medicinal plants (cultivated and non-cultivated) like cultivated Lavender. For this reasons, combining the implementation of renewable energy (from sunlight) with aromatherapy treatment by Lavender plant was very challenging. The scope of this research is determination of the way of combination and application of renewable energy in aromatherapy. This therapy was used for distribution of medicinal plants aroma in environments with areas until 40m^2, also and for curing the respiratory tract and mental state of the people. The whole experimental system was set up in laboratory of company "Salvia Nord" Shpk, Koplik-Malesi e Madhe, Albania, which combined application of equipments with electrical energy, direct current, taken from Photovoltaic Solar Panel. The equipment (diffuser) served as a distributor of aroma, by using a ratio distilled water – oil distilled from Lavender plant.

Keywords: Cultivated Lavender plant, Diffuser, Aromatherapy, PV Panel, "Salvia Nord" Shpk, Solarmont 5000L 2-3H2.

1. Introduction

Aromatherapy is one of the most ancient healing arts and traces its origin to 4500 B.C., an era when Egyptians used aromatic substances in medicines. Greeks also used plant essences for aromatic baths and scented massages (M. Sugumaran and T.Vetrichelvan, 2008). Aromatherapy is the use of essential oils taken from plants to improve quality of life and reduce stress and anxiety (Keville, K. and Green, M., 2009).

Indication	Evidence Grade
Anxiety (aromatherapy)	B
Hypnotic/Sleep (aromatherapy)	C
Perineal discomfort following childbirth (bathing)	C
Spasmolytic (oral)	C
Antibiotic (topical)	C
Cancer (oral perillyl alcohol [POH])	C

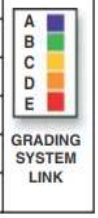

Figure 1. Scientific Evidence for Common/Studied Uses (Basch E, Foppa I, Liebowitz R, Nelson J, Smith M, Sollars D and Ulbricht C., 2004)

Aromatherapy is a form of alternative medicine that uses volatile plant materials, known as essential oils, and other aromatic compounds for the purpose of altering a person's mind, mood, cognitive function or health (Yatri R. Shah, Dhrubo Jyoti Sen, Ravi N. Patel, Jimit S. Patel, Ankit D. Patel and Parimal M. Prajapati., 2011). How can aromatherapy serve a person? What impact does it have on healing the mental side? Many questions asked are related to the type and method of treating the flower to obtain the essential oil. Lavender

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flower is one of the most typical. Lavender plant is native to the Mediterranean, the Arabian Peninsula, Russia, and Africa. It has been used cosmetically and medicinally throughout history. In modern times, lavender is cultivated around the world and the fragrant oils of its flowers are used in aromatherapy, baked goods, candles, cosmetics, detergents, jellies, massage oils, perfumes, powders, shampoo, soaps, and tea (Basch E, Foppa I, Liebowitz R, Nelson J, Smith M, Sollars D and Ulbricht C., 2004).

The essential oil during use affects the improvement of respiratory tract clearance, stress reduction, etc. The energy used for the treatment in the flower distiller is electricity. The amount of electricity used depends on the amount distilled and the working time of the distiller. The cost of electricity production is increasing more and more. Alternative energy or renewable energy is another form of energy to be used in this profitable industry. It is definitely set to become economical in the coming years and growing as better technology in terms of both cost and applications. This is an unlimited source of energy which is available at no cost. The major benefit of solar energy over other conventional power generators is that the sunlight can be directly converted into solar energy with the use of smallest photovoltaic (PV) solar cells (Shaikh. M.R.S, Waghmare. S.B, Labade.S.Sh, Fuke.P.V, Tekale. A, 2017). Its use, today, has found a larger space than many years ago. Biomass is one of the renewable bioenergy sources capable of contributing significantly to the future global energy supply (WEC, 2004). A photovoltaic cell is a form of photoelectric cell, defined as a device whose electrical characteristics, such as current, voltage, or resistance, vary when exposed to light. Solar cells are the building blocks of photovoltaic modules, otherwise known as solar panels. Solar cells are described as being photovoltaic irrespective of whether the source is sunlight or an artificial light (Arun. M, 2019). The earth receives energy directly from the sun. It is silent, inexhaustible, and non-polluting (Eastop T.D., McConkey A., 2002). The utilization of solar energy depends on its availability and appropriate technology (Nasir, A., 2001). The solar radiation arrives at the earth at a maximum flux density of about 1kw/m2 in wave length of band between 0.3 and 2.5μm (J. O. Oji, N. Idusuyi , T. O. Aliu , M. O. Petinrin , O. A. Odejobi , A. R. Adetunji 2012). For habited areas fluxes received vary widely from about 3 to 30MJ/m2 /day, depending on place, time and weather (J. O. Oji, N. Idusuyi , T. O. Aliu , M. O. Petinrin , O. A. Odejobi , A. R. Adetunji, 2012). The quality of radiation is characterized by the photon energy of around 2eV as determined by 6000K surface temperature of the sun (John W. T., Anthony D. W., 1987). The electrical current is generated as photons from sunlight are absorbed and charges are generated in a semiconductor material. Semiconductors such as silicon absorb a large fraction of sunlight, but below the absorption edge (band gap) of the semiconductor, no absorption occurs (Inganäs O, Sundström V., 2016). The scope of this research is determination of the way of combination and application of renewable energy in aromatherapy and their costs of production.

2. Material and Methods

The experiment took place in the laboratory of the company "SALVIA NORD" Shpk, Koplik-Malesi e Madhe, Albania, specialized in the production and treatment of aromatic medicinal plants. The experiment was carried out in 20 Ha of land suitable for the cultivation of these plants in the area of Shkodra. This experiment consists in the process of drying the plants and distilling them. The photovoltaic panel is of the "Grunding" brand. The photovoltaic panel has a surface of 0.15 m x 0.45 m, with a production power (Pprod) of 6.75 Wm^2. The voltage it produces is 12V and DC current. The positioning angle of the photovoltaic panel is 45°, direction South. Accumulator battery with technical characteristics, 12V voltage and DC current. ON/OFF switch, diffuser with technical characteristics 5V/1A and DC current. The application of aromatherapy (through a diffuser) combining it with renewable energy (solar panel) as well as determining the effectiveness (health and economic).

From the work carried out for the success of the experiment near the laboratory of the company "SALVIA NORD", Koplik-Malësi e Madhe, it was seen that aromatherapy is a very good method to apply. The geographical position of our country, with a Mediterranean climate, enables the growth of many medicinal plants. The application method divided into two subgroups, such as the distillation process and the diffusion process (from the diffuser), were very efficient. These methods, seen from the scientific-medical point of view, can be applied in the treatment of people with respiratory or mental problems. At the same time, this method manages to aromatize the

environments of houses, offices, etc., up to a surface of 40 m^2 in a period of time of 5 minutes.

Figure 2. Distillation of essential oil from the Lavender flower.

The distillation process from the "Solarmont 5000L 2-3H2" apparatus, as a key process in the extraction of essential oil from the Cultivated Lavender (Lavandula) flower, proved to be one of the basic branches of the development engine of the Albanian economy in the trade of medicinal plants in the world

3. Results and Discussion

The most important point is the integration of renewable energy development technology with aromatherapy. To be independent from grid electricity, it was carefully observed that photovoltaic panels are one of the best possible solutions. Albania, with its geographical position, has about 308 sunny days/year. This greatly favors the application of photovoltaic panel technology. The production of electricity from photovoltaic panels will reduce the consumption of electricity in the network produced by hydro and at the same time will create the possibility of not depending on the energy of the network. The absorption of solar rays by the panel is carried out by means of photovoltaic cells. These cells, which in its structural base have semi permeating elements such as silicon. The property of these elements for the transformation of solar rays into electricity is achieved in the properties that these electromagnetic waves (photons) possess. The totality of these cells together forms the so-called photovoltaic panel or PV Panel. The energy produced is direct current, 12V. This generated voltage was used by our diffuser, which operates at a power of 5W (5V / 1A). In this electrical circuit, a DC-Converter was placed, that is, a voltage converter from 12V to 5V, to enable the operation of our device (Diffuser) with the necessary voltage (Fig.3). Knowing that the maximum of the sunny day is 10 hours, this did not enable the 24-hour supply of electricity from the PV panel of our device. It was considered reasonable to place an auxiliary device in this network, i.e. the accumulator. This enabled the accumulation of electricity generated by the solar panel and the use of this energy in the absence of electricity production from the PV Panel, i.e. in the absence of solar rays (Fig.3).

The photovoltaic panel as the main source of electrical energy (renewable energy) in this experiment shows that its use is very efficient. From the calculations, it is shown that the photovoltaic panel with a power of 6.75 Wm^2, is able to supply electricity to a diffuser (with a power of 5W), for a relatively long time (1 month).

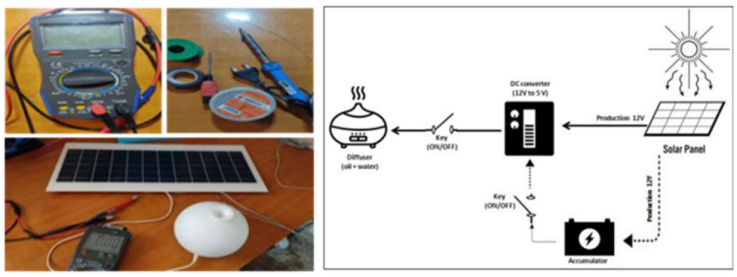

Figure 3. The scheme of application of renewable energy with the process of aromatherapy

$P_{(panel\ production)}$: 6.75 W

t_1: 24 hours (1 day)

t_2: 1 hour

$$P_{day} = \frac{P_{panel\ production} \cdot t_1}{t_2} \quad (1)$$

$$P_{month} = P_{day} \cdot 30_{days} \quad (2)$$

Accordingly, the monthly production (absolute) of the panel is 4860 W or 4.86 KW/month. The efficiency calculated in the panel is about 98% (so about 2% loss). This shows that the panel used in our experiment is within the limits of the values allowed to be used. The (relative) value of the electricity produced by our panel is around 4.7 KW. The diffuser itself has a lower electricity consumption value. From the performed calculations (presented below), it is shown that the diffuser has a power of 5 W. The monthly consumption (shown by the formulas below), which this diffuser can perform, is 3.6 KW.

$P_{diffuser}$: 5 W

t_1: 24 hours (1 day)

t_2: 1 hour

t_3: 6 hours

$$P_{effective} = \frac{P_{diffuser} \cdot t_3}{t_2} \quad (3)$$

$$P_{day} = \frac{P_{effective} \cdot t_1}{t_3} \quad (4)$$

$$P_{month} = P_{day} \cdot 30\ days \quad (5)$$

4. Conclusions

In conclusion, we say that the development and application of renewable energy finds use in a wide range of fields, being best applied in the field of aromatherapy. Its acquisition through renewable energy in photovoltaic panels increases the effects or the positive impact of the use of aromatherapy in the environment, improving people's health and reducing the negative impact on the environment.

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