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An experimental study on rose water production

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ABSTRACT

An innovative approach incorporated to predict large quantity of rose water extraction through distillation process in a solar still under the climatic conditions of Coimbatore, India (11˚.00 N, 77 ˚ E). The rose water extraction to utilize the process is performed to increase the large yield rate by coupling the still with the concentrating assembly. The hourly rose essence yield from the still and efficiency are recorded. In normal evaporation process of the still requires more time to evaporate the content in the still which spends 1½ hour for evaporation. But in this type of still concentrator plays a major role for evaporating the content within a short duration of time. It requires only 10 minutes for evaporation. Thus this type of still is very much support to extract the rose essence without any loss of smell. The conventional solar still loses its smell even before the evaporation process.

Introduction

Solar energy plays a vital role in each and every aspect of our life also it has great potential in becoming a main source of energy in the future. Today people use solar energy to water heating, cooling and ventilation, water treatment, cooking, photovoltaic modules and solar pumping. These are the important applications for our day today life. The solar radiation can be converted directly into electricity by using photovoltaic panels or indirectly by solar thermal collectors. Generally, water heating is also a major problem due to the increase of cost for fuels. The increase of population is also one of the reasons for increasing the cost of fuel rate. The man does not accommodate fuels such coal, petroleum, wood etc., for their future utility due to scarcity and high cost. So our human society is expecting an alternative source of energy for their comforts. The problem like water heating, steam generation and power generation can be overcome by using concentrator coupled devices. Studies have been performed by the variation of evaporative heat transfer coefficients in a conventional still and in an inverted absorber solar still by Sangeeta Suneja and G.N. Tiwari [1-5].

A rose water distillation system is constructed by using hemispherical basin solar still coupled with concentrator assembly. The temperature profile, efficiency and hourly output are calculated and discussed.

Experimental study

The image of the focal absorber of the focal object fills up almost the entire aperture, i.e., intercept factor is kept ~ 1. The concentrator is made to track the sun. Experimental data were collected at different time intervals. It was found that rose petals of water in the absorber attained the maximum temperature in very short time intervals, thereby, increasing the moisture content of the air trapped between the water surface and the glass cover. The glass cover is kept in slanting position to collect the condensate. The portable water output of the still is frequently measured. Temperature of water, air, inner cover and outer cover temperature were also recorded at an interval of fifteen minutes. Precision Pyrheliometer and pyranometer were used for measuring the total solar radiation throughout the experiment at regular intervals of time. The rose water preparation technique is shown in Fig. 1. Schematic view of experimental device is shown in Fig. 2. Fig. 3(A) and (B) shows the pictorial view of concentrator assisted solar still.

Fig. 1 Rose water preparation, (Fig. 1A) Fresh rose petals, (Fig. 1B) Rose petals in the container, (Fig. 1C) Distilled rose water essence, (Fig. 1D) Final dried rose petals

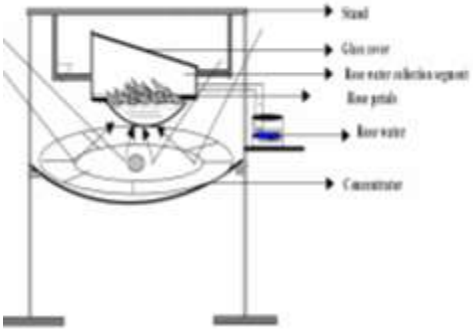

Fig. 2 Schematic view of rose water distillation unit

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Fig. 3 Pictorial view of rose water distillation unit and Rose water container gets the heat flux from concentrator

Results and discussion

The rate of rose yield is presented in Fig. 4. A peak production rate is served at 12:00 p.m. and it begins to decrease after 1:00 p.m. The average daily distilled output is based in data on March 2011 as 1.2 L/m2. In many conventional solar stills, the production rate starts to increase after 11:00 p.m. due to the warming period. But this draw back was improved in this system. The direct consumption of time for solar radiation and reflected flex from the concentrator are focused at the hemispherical rose water storage container. The rose water containing absorber reaches the nearing boiling point of 86°C. So the rose water is heated rapidly and laid a path to the higher rose essence yield. Variations in the efficiency of the still stand depicted in Fig. 5. The system efficiency is ranged 3% to 43.02%. The overall system efficiency is calculated as 27.69%.

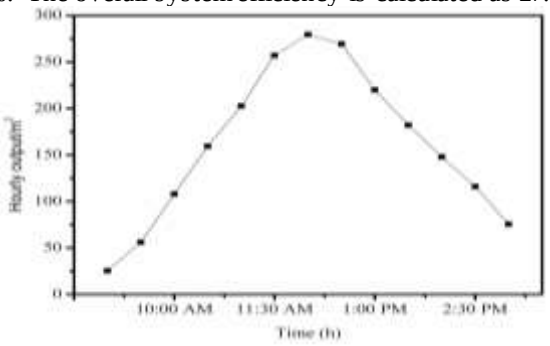

Fig. 4. Variation of productivity with respect to time

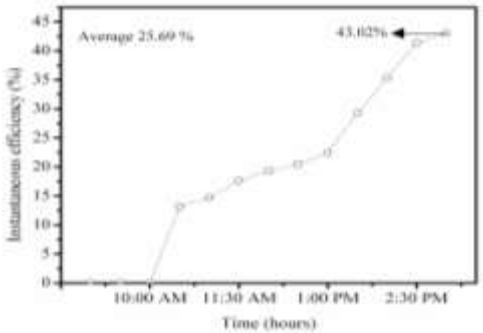

Fig. 5. Variation of efficiency with respect to time

Conclusion

The concentrating solar distillation system is appropriate for rose water production in the rural areas and this examine work can be included as one of the miniature scale plants. The average daily distilled output is collected as 1.2 L/m^2.The efficiency of the solar still 25.36% and the input is richly available solar power.

No extra power is required to heat and boil the fresh rose petals. The solar still is simple to fabricate and it will produce the essence of rose water in very good quality.

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