A potential approach to simplify both storage and transportation is to lower the water content in fruit juices. The traditional technique uses thermal evaporation in film evaporators. This study offered an alternative approach for concentration of fruit juice based on stripping of water from fruit juice by an unsaturated gaseous stream in contactors operating in a strong gravitational field produced by rotating the contactors. Two such contactors were studied – a packed bed rotating about a vertical axis and the other a rotating baffled contactor wherein the phases zigzag across concentric circular baffles fitted in the inner surface of the disks. The value of evaporation rate of water ($\dot{m}$) increased from 0.0278 kg/min to 0.0372 kg/min in the rotating baffle bed at air flow rate 400 LPM, and from 0.0124 kg/min to 0.0188 kg/min in rotating packed bed contactor at the same air flow rate when the rotational speed was increased from 400 to 1000 rpm, keeping the other parameters constant (water flow rate 1 L/min and inlet temperature 50 ^{0}C). The increase in evaporation rate with rotational speed is partly due to the increase of gas-liquid interfacial area as a result of thinner films and smaller drops besides more vigorous mixing. Evaporation rate increased from 0.026 kg/min to 0.039 kg/min in RC-1, and 0.015 kg/min to 0.023 kg/min in RC-2 (air flow rate 400 L/min) with increase in the water flow rate from 0.5 to 1.5 L/min. At higher liquid flow rate more homogenous distribution of the liquid droplets takes place as more of the distributor openings become functional. This increases the gas-liquid surface interfacial area in both the contactors. At air flow rate 400 L/min, as the temperature was varied from 40 ^{0}C to 60 ^{0}C, there was an increase in the evaporation rate from 0.020 kg/min to 0.045 kg/min in the rotating baffle bed and 0.013 kg/min to 0.028 kg/min in the rotating packed bed. Higher temperature enhances the mass transfer driving force due to increase in the difference in partial pressure of water resulting in higher evaporation rates. Simultaneous heat and mass transfer experiments performed with an air-water system indicated that the

evaporation rate was higher in the baffled rotating contactor compared to rotating packed bed contactor. The volumetric mass transfer in the baffled rotating contactor varied between 7 kg/m^{3}s and 20 kg/m^{3}s and from 1.4 kg/m^{3}s to 4.45 kg/m^{3}s for rotating packed bed for the range of various conditions (rotational speed: 200 rpm - 1000 rpm; airflow: 200 L/min - 400 L/min; liquid flow rate: 0.5 L/min - 1.5 L/min; temperature: 45 - 60 ^{0}C). The evaporation rate of water achieved in the baffled contactor is nearly 30 times higher than with the direct contact evaporation technique proposed by Ribeiro et al. by bubbling hot air through the solution. The evaporation rate achieved in this study is 38 g/min at a superficial gas velocity of 53 cm/s for pure water at 50 ^{0}C. Internal design of the rotor plays a significant role in influencing the performance of this concentration technique. The equipment volume for the same evaporation rate was theoretically calculated to be lower as compared to conventional thin-film evaporators. Maximum concentration achieved in orange juice in RC-1 was 32.8 ^{0}Brix and 24.6 ^{0}Brix in RC-2 (from an initial 10 ^{0}Brix). The highest concentration of tomato and watermelon fruit juice (Lycopene rich fruits) attained in RC-1 were 15.7 ^{0}Brix and 27.5 ^{0}Brix from the initial 4.2 ^{0}Brix and 5.9 ^{0}Brix respectively. The values for concentration in both juices achieved in RC-2 were 10.9 ^{0}Brix and 15.9 ^{0}Brix. From an initial concentration of 14 and 15.5 ^{0}Brix the maximum concentration achieved in black grapes and pomegranate juices (antioxidant-rich fruit juices) were 45.8 ^{0}Brix and 59.4 ^{0}Brix in RC-1. The corresponding concentration values achieved in RC-2 were 35.8 ^{0}Brix and 47 ^{0}Brix respectively. Maximum concentration achieved in sugar-rich grapes juice was 45.6 ^{0}Brix and in sugarcane juice was 29.3 ^{0}Brix in the rotating baffled contactor. The total soluble solids in RC-2 were 36.3 ^{0}Brix and 21.5 ^{0}Brix respectively. Response surface methodology was used to study the individual contribution of various operating parameters and a quadratic model was developed for all seven fruit juices. The coefficient of

determination (R^2 value) for orange, black grapes, grapes, pomegranate, tomato, watermelon, and sugarcane was 0.9766, 0.9779, 0.9699, 0.9806, 0.9646, 0.9745 and 0.9775 respectively which indicates good agreement between the predicted values and the experimental ones. The ANOVA results also predicted the statistical significance of the study. The physiochemical analysis reported in this study suggests that there is no drastic change in the pH, total acid content, and color content of the feed juice and the concentrated juice. Experimental results obtained with fruit juices suggest that the proposed strategy using high gravity contactors can be further explored for the concentration of liquid foods.