The change in overall quality attribute with respect to time is determined by the Kinetic rate law model (T. Defraeye et al., 2019; Van Boekel, 2008; Wu, Cronjé, et al., 2018; Wu & Defraeye, 2018). It is given by

|  |  |
| --- | --- |
|  | 8 |

where is time [s], is the rate constant [s-1], is the order of reaction which determines change of with respect to time.

where is quality at start of the cold chain. is dependent on temperature, which is further solved over time with the help of Arrhenius relationship, given as:

|  |  |
| --- | --- |
|  | 11 |

where is a constant [d-1], is the activation energy [J mol-1], is the ideal gas constant [8.314 J mol-1K-1], is the absolute temperature [K].

Mangoes can be stored for 28 days at 285K (Kanade, Gajbhiye, & Salvi, 2017), which indicates that its initial overall quality attribute is 100 % and after 28 days it is 1 % that is it’s in non-consumable condition. An increase in temperature of 10K decreases the shelf life of the fruit by a factor of 2 (Kanade et al., 2017). From these conditions and by using eq. (9), eq. (10) and eq. (11) the values of the constants and are determined.

The rate constant varies with temperature. Different rate constants are obtained at different fruit core temperatures and hence the overall fruit quality attribute of individual mangoes in the box with respect to time.