Respiration-R.Q. and values
The energy present in one gram of different respiratory substrates is

(i) Fat-9.8 kcal or 41 kJ
(ii) Protein-4.8 kcal or 20 kJ
(iii) Carbohydrate -4.4 kcal or 18.4 kJ. The realized value is slightly less.

R.Q. or respiratory quotient is the ratio of volume of carbon dioxide evolved to the volume of oxygen consumed per unit time per unit weight. RQ. = CO_2/O_2. It is useful in knowing the type of respiration, major transformations and respiratory substrate. For example, R.Q value is

(i) Unity - Aerobic respiration, respiratory substrate carbohydrate. .

$C_6H_{12}0_6 + 60_2 \text{----} \rightarrow 6C0_2 + 6H_20$;

R.Q $6CO_2 / 60_2 = 1$

(ii) Infinity- Anaerobic respiration.

Zymase

$C_6H_{12}0_6 \text{ ----} \rightarrow 2C_2H_5OH + 2CO_2$;

RQ. $2CO_2$ /Zero = Infinity

(iii) Zero-
(a) Succulents due to carbon fixation during night and closure of stomata during day.

(b) Oxidation of carbohydrates to form organic acids.

$C_6H_{12}0_6 + 3O_2 \rightarrow 3C_4H_60_5 + 3H_20$; RQ. Zero/$3O_2$ = Zero

(iv) More than One –

(a) Maturing fatty seeds
(b) Organic acids (4 for oxalic acid, 1.3 for malicacid, 1.14 for succinic acid).

$2(COOH)_2 + O_2 \rightarrow 4CO_2 + 2H_2O$;
oxalic acid
RQ = $4CO_2 / O_2 = 4.0$

$C_4H_60_5 + 3O_2 \rightarrow 4CO_2 + 3H_2O$;
malic acid
RQ. $4CO_2 / 3O_2 = 1.3$

$2C_4H_60_4 + 70_2 \rightarrow 8C0_2 + 6H_2O$;
succinic acid

RO = $8CO_2 / 7\ O_2$ or 1.14

(v) Less than One-
(a) Fats (=0.7)
(b) Protein (=0.7-0.9)
(c) Germination of fatty seeds.

$C_{57}H_{1O4}O_6 + 80O_2 \rightarrow 57CO_2 + 52H_2O$; triolein

$RQ.57CO_2/80O_2 = 0.71$

$2(C_{51}H_{98}O_6) + 145O_2 \rightarrow 102\ CO_2$ + tripalmitin + $98\ H_2O$;
RQ = $102\ C0_2/145\ 0_2$ or 0.7