Key Point:- Oxdn of 1 molecule of pyruvate through the citric acid cycle produces:-

(i) 3 molecule of CO_2
(ii) 4 NADH and 1 $FADH_2$.
(iii) 1 molecule of ATP

Diff bet^n CA cycle of plants and animals:

(1) The step catalyzed by succinyl-CoA synthetase produces ATP in plants and GTP in animals.

(2) A feature of the plant citric acid cycle that is absent in many other organisms is the significant activity of NAD^+ malic enzyme, which has been found in the matrix of all plant mitochondria analyzed to date.

If there is an inhibitor in glycolysis pathway i.e. pyruvate is not produced in optimum amnt, then NAD^+ malic enzyme can convert malate directly to pyruvate. This is possible only in case of plants.

Malate
↓ NAD^+ Malic enzyme $NADH$.

All the hydrogen atoms from the original glucose are now on hydrogen carriers, NAD and FAD.

↓

These hydrogen carriers enter the next phase known as respiratory chain or Electron Transport Chain (E.T.C) for further release of energy.

Complexes involved in ETS:

The e^- transport chain catalyzes an e^- flow from NADH (and $FADH_2$) to oxygen, the final e^- acceptor of the respiratory process.

↓

ETS in plants contain multiple NADH deg dehydrogenases and an alternate oxidase.

↓

ETS catalyses an e^- flow from NADH to O_2 (final e^- acceptor).

↓

Process carried out by 4 integral membrane bound enzyme complexes in inner mitochondrial membrane.

Doubt :- Are they

Complex I (NADH dehydrogenase).

Electrons from NADH are oxidized by Complex I.

↓

The e^- carriers in complex I include a tightly bound cofactor FMN and several Fe-S centers.

↓

Complex I transfers these e^- to ubiquinone (a small lipid soluble e^- and proton carrier, located within the inner membrane).

↓

$4H^+$ are pumped from the matrix to the intermembrane space for every e^- pair passing through the complex.

↓

Complex I is inhibited by Rotenone (inhibitor).

Complex II. (Succinate dehydrogenase).

Oxdn of succinate in the citric acid cycle is catalyzed by this complex II.

↓

The resulting e^- are transferred via the $FADH_2$ and a group of Fe-S proteins into the ubiquinone pool.

↓

This complex does not pump protons.

Notes

Complex III (cytochrome bc1 complex).

This complex oxidizes reduced ubiquinone and further transfers the e^- to cytochrome c.

↓

$4H^+$ are pumped per e^- pair by complex III.

↓

Cytochrome c is a small protn loosely attached to the outer surface of the inner membrane and serves as a mobile carrier to transfer e^- betⁿ complexes III and IV.

↓

Complex III is inhibited by Antimycin (inhibitor)

Complex IV (cytochrome c oxidase).

Complex IV is terminal oxidase.

↓

Complex IV contains 2 copper centers and cytochrome a and a3.

↓

$2H^+$ are pumped per e^- pair.

↓

Complex IV is inhibited by CO, cyanide and azide.