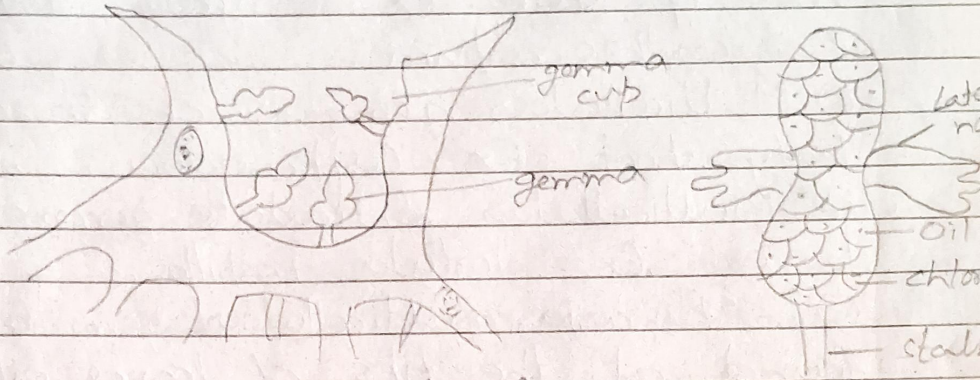


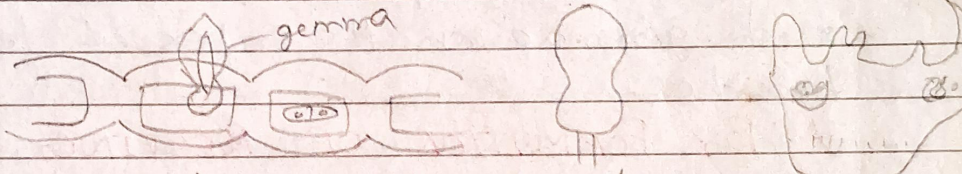
5. Discoid gemmae or erect gametophore branches - Ex - Metzgeria, Nucigera.

6. Star shaped gemmae on the dorsal surface of the thallus of Blasia species.



T.S of gemma cup of Marchantia

A Single gemma



Riccardia gemma

Linularia gemma

Metzgeria gemma

B. ANTHOCEROTOPSIDA →

1. In Anthoceros glandulosum, gemmae formation has been reported on the dorsal sides of the thallus which on separation form new thallus.

2. In A. formosae, gemmae is borne at the margin on dorsal surface.

C. BRYOPSISIDA →

Staked, multicellular, green lenticular gemmae are found at the base of the shoot which is surrounded by a cup like structure formed by leaves. Ex - Tetraphisbellucida.

① Stalked fusiform gemmae at the end of distinct leafless terminal stalk. Ex - *Aulaconium* species.

② Globular, multicellular gemmae at base of stem. Ex - *Bryum rubens*, *B. erythrocarpum*.

③ Multicellular gemmae on rhizoids or leafy shoot. Ex - *Cupressida*.

④ Multicellular articulate gemmae on leaves. Ex - *Tortula*, *Popilla*.

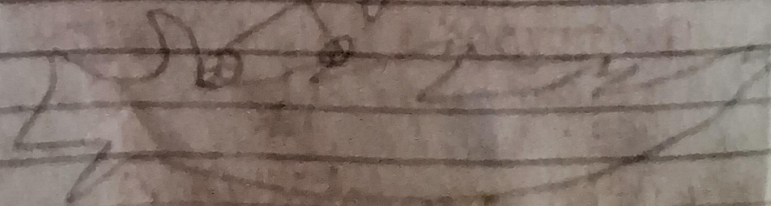
⑤ In *Funaria*, multicellular gemmae are found at the tips of leaves at the apex of the stem and on the rhizoids. Barkley (1914) reported the formation of such gemmae on the apex of terminal branches.

7. BY FORMATION OF RESTING BUDS

Some times small resting buds are developed on other side of Protonema or on the rhizoids as in *Funaria*.

The growth of these buds are arrested after sometimes and become dark in colour. They also lose their chlorophylls. In return of favourable conditions they develop into new plants or secondary protonema.

resting bud



In *Bryum*

8. BY CREEPING SHOOT → In some species of Funaria, the long axis may produce creeping shoot with reduced leaves. Later on upright leafy branches are given out from the creeping shoot. This leafy branches separate and develop into new plant.

9. BY FORMATION OF BULBILS → special bulb like structure known as bulbil are formed on underground rhizoidal condition in case of several Bryophytes. The cells of bulbil is devoid of chlorophyll but contain starch. Ex - Bryum, Blasia.

10. BY APOSPORY → Long (1909) successfully developed a diploid gametophyte in Anthoceros leaves by cutting pieces of sporophyte. Each piece of sporophyte developed into a new thalli.

11. BY CLADIA FORMATION →

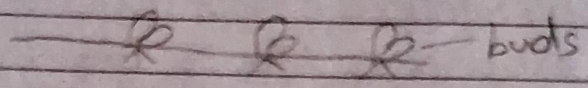
1. Small detached branches are effective in vegetative reproduction is called cladia.

2. Leaf cladia originate only from the individual cell of the leaf as in Bryophytes species.

12. BY RHIZOIDAL CELLS → In case of Hepaticopsida rhizoids which is tubular unicellular (unilocular) hairy structure divide and redivide to form multicellular structure which is developed into a new individual. Ex - Funaria.

13. BY PRIMARY PROTONEMA → The filamentous and branched primary protonema

breaks up into smaller fragment of leafy green cells by death and decay of cells at intervals. Each such detached fragment grow into a protonema which bears fresh crop of leafy gametophyte.
Ex - Bryidae



Pr. Protonema of Funaria.

14. BY SECONDARY PROTONEMA → The protonema developed from primary protonema is known as sec. protonema which gives rise to the bud. In case of Funaria, Sphagnum and other mosses the rhizoids come out of the soil, develop chlorophylls and become just like the protonema. These secondary protonema develop from the marginal cells of the primary protonema.

15. BY THE FORMATION OF STOLONIS → Some mosses develops stoloniferous branches from the base of the stem. The stolon may be naked or bears swollen scaly leaves and grow on or beneath the surface of soil. Eventually tip of each stem grows upward as an upright leafy axis.

16. DECIDUOUS LEAVES → Degen Kolbe (1937)

stalked that in *Furaria*, *Fragilifolia*, the anterior lobes of the lateral leaves are shed as propagules leaving behind the posterior lobes intact along the stem. The detached propagules give rise to a new plant under cultural conditions.

17. BY PERIANTH TUBERCULAE → Fulford

(1959) doubted the formation of the gemmae in *Frullaria*. She reported the formation of one to several celled tuberculation of the surface of the perianth in *Edilitata*. These tubercles said as propagules and each give rise to a new plant.

18. BY REGENERATION → Covers (1903) and

Koch (1909) reported the regeneration *Pelliaephylla*, *Pellia*, *Calyceina* from the thallus in culture. Concluding all the mode of propagation in Bryophytes one idea arises about the circumstances in which those members have to dominant. Probably they are aquatic and little change of its spore dispersal due to lack of such characters the nature fitted this group the various modes of vegetative reproductions.

CONCLUSION

