

(Lloyd and Klekowski 1970; Pandey 2003), as seen in many vivipary cases. However, this character is evolutionarily important and rare in homosporous ferns like *Grammitis medialis* (Irudayaraj et al. 2003). In general, vivipary can be divided into two major different forms based on their mode of formation, namely, true vivipary and pseudovivipary. True vivipary describes that plants produce sexual offspring and pseudovivipary describes that plants that produce apomictic or asexual propagules, such as bulbils or plantlets, in the place of sexual reproductive structure with the mother plant itself. Pseudovivipary plants exclude vegetative budding not associated with reproductive axes (Elmqvist and Cox 1996; Tomlinson and Cox 2000).

11.2 VIVIPARY PLANTS

Naturally, some fern genera and families produce viviparous plantlets by asexual reproduction on the sporophyte fronds of *Adiantum*, *Asplenium*, *Camptosorus*, *Cystopteris*, *Diplazium*, *Tectaria*, *Woodwardia*, *Cyathea arborea*, *Asplenium bulbiferum*, *Dennstaedtia scabra*, Grammitidaceae, Hymenophyllaceae and Vittariaceae (Mickel 1967; Faden 1973; Page 1979; Bir 1995; Rozario et al. 2001; Graham 2011). The germination of fern spores within the sporangium without a dormancy period is called vivipary, and contain very few homosporous pteridophytes (Lloyd and Klekowski 1970; Pandey 2003; Irudayaraj et al. 2003). Likewise, the germination of seeds was reported in gymnosperms plants namely, *Biota orientalis* (Gahalain et al. 2006), *Cupressus torulosa* (Majumder et al. 2010), *Ginkgo biloba* (Favre-Ducharte 1958), *Podocarpus makoyi* (Lloyd 1902), *Podocarpus macrophyllus* (Mahabale 1961), *Ephedra trifurca* (Coulter and Chamberlain 1955), *Pinus wallichiana* (Wali and Tiku 1965), Angiosperms (Elmqvist and Cox 1996), mangroves (Farnsworth and Farrant 1998), *Kalanchoe daigremontiana* (Garces et al. 2014), *Eleusine coracana* and *Setaria viridis* (Li 1950), monocot/poaceae (Lee and Harmer 1980). An asexual reproduction in the form of gemmae cup and adventive branches were reported in Bryophytes (Cavers 1903). Table 11.1 summarizes the viviparous ferns (see Figure 11.1), their altitude, bioactive compounds and their ornamental and pharmacological uses.

11.3 MEDICINAL, EDIBLE USES AND BIOACTIVE PRINCIPLES OF VIVIPAROUS FERNS

Some viviparous ferns are edible, for example, the shoots and fiddleheads of the 'hen and chickens fern' (*Asplenium bulbiferum*) were eaten in the form of greens by the early Maori. Their leaves contain antioxidant flavonoids, such as kaempferol glucosides (Imperato 1984). Secondary metabolites, namely, Apigenin-7-O-rhamnoside, luteolin-7-O-dirhamnoside, genkwanin-4'-O-glucosylrhamnoside, apigenin-7-O-rhamnoside-4'-O-glucosyl-rhamnoside and its derivatives and apigenin 7,4'-di-O-rhamnoside were isolated in *Asplenium normale* (Sadamu et al. 2003). Out of eight flavone glycosides from the fronds of *Asplenium normale*, six of them, namely, apigenin 7-O-dirhamnoside, 7-O-glucosylrhamnoside, luteolin 7-O-dirhamnoside, 7-O-glucosylrhamnoside, genkwanin 4'-O-glucosylrhamnoside and vicenin-2 were isolated. The remaining two glycosides were tentatively