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A seed protein from Moringa oleifera used in traditional water purification: structural and in vivo studies

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Moringa oleifera is a tropical plant that belongs to the Moringaceae family and is native to northern India. The tree grows quickly and is cultivated in tropical areas. Moringa oleifera is also called The Miracle Tree1 because many of its parts have valuable applications. In particular, seed extracts from the plant have been used in traditional water treatment throughout Africa. The application of this extract to untreated water causes a 95% reduction of turbidity, and a decrease in particle and bacterial content. Numerous laboratories have demonstrated these effects but the precise nature and properties of the active components in the extract has been unclear. Small-angle neutron scattering has demonstrated the unusually dense nature of flocs formed with seed extract2 and reflection studies have been carried out, to determine the arrangement of protein adsorbed at model interfaces3

We have analysed seed extract from Moringa oleifera and separated a major component protein that has a molecular mass of 11.8 kDa. The protein was purified in a two-stage process and crystallised. A recent crystallographic study yielded data to a resolution of 1.6 Å, and the molecular structure was solved using sulphur SAD. The structure contains 4 disulphide bonds, and the analysis has yielded a substantial part of the amino acid sequence. These data are being correlated with results from N-terminal sequencing, in combination with trypsin digestion.The pure protein is also being studied to probe a rational basis for the nature of the activity of the crude extract in traditional water treatment. Initial tests have demonstrated a bacteriostatic/bacteriocidal effect on living E.Coli cells. In future, we will use a recombinant expression system to produce a deuterated protein for a neutron crystallographic analysis aimed at understanding the nature of hydration interactions and protonation states in the structure.

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