The gourd vegetables are excellent source of essential constituents and bioactive compounds required for good health. Polyphenols are abundant in gourd vegetables and recognised as the most abundant dietary antioxidants. The effect of cooking treatments (pressure cooking, microwave cooking and frying) and extracting solvents (absolute methanol, ethanol and butanol) was investigated on the antioxidant activity of selected gourd vegetables. The antioxidant activity was investigated using different assays namely ferric thiocyanate (FTC) assay, thiobarbituric acid (TBA) assay, ferric reducing antioxidant power (FRAP) and DPPH free radicals scavenging assay. A densitometric HPTLC analysis was performed for the analysis of phenolic acids and flavonoids. Different extracts of the selected gourd vegetables revealed different antioxidant activity. In general, the recovery of total phenolics and antioxidant activities as measured by various assays were the highest in methanolic extracts followed by ethanolic and butanolic extracts. In case of raw vegetables different extracts of Lagenaria siceraria, Momordica charantia and Luffa cylindrica revealed significantly higher (p<0.05) concentrations of total phenols, flavonoids, tannins and carotenoids content and also the antioxidant activity in comparison to remaining vegetable extracts. The pressure cooking and frying was most effective cooking treatments to retain the polyphenol and antioxidant activity in most of the selected vegetables. The microwave cooking caused the destructive effect on polyphenol content as well as on the antioxidant activity of most of the selected gourd vegetables. Correlation studies indicated that FRAP test best described the antioxidant activity of phenols, flavonoids and carotenoids. HPTLC analysis of the methanolic extracts revealed the presence of maximum number of phenolic acids and flavonoids in M. charantia and L. siceraria. The destruction, leaching and transformation of various phenolic acids and flavonoids were observed after different cooking treatments. Thus, keeping in view of the selectivity and specificity of the polyphenolic antioxidant compounds to the process parameters, it requires further studies concentrating on characterisation of individual polyphenolic compounds.