Abstract: This thesis deals with chance constrained stochastic programming problems. We consider several chance constrained models and we focus on their convexity property. The thesis presents the theory of $\alpha$-concave functions and measures as a basic tool for proving the convexity of the problems. We use the results of the theory to prove the convexity of the models first for the continuous distributions, then for the discrete distributions of the random vectors. We characterize a large class of the continuous distributions, that satisfy the sufficient conditions for the convexity of the given models and we present solving algorithms for these models. We present sufficient conditions for the convexity of the problems with discrete distributions, too. We also deal with the algorithms for solving non-convex problems and briefly discuss the difficulties that can occur when using these methods.