In recent years, decision makers give more im- portance to the maintenance function, viewing its substantial contribution to business productivity. However, most litera- ture on scheduling studies does not take into account main- tenance planning when implementing production schedules. The achievement of production plan without taking into account maintenance activities increases the probability of machine breakdowns, and inversely, considering mainte- nance actions in production planning elongates the achieve- ment dates of orders and affects deadlines. In this paper, we propose a bi-objective model to deal with production sched- uling and maintenance planning problems simultaneously. The performance criteria considered for production and maintenance are, respectively, the total tardiness and the unavailability of the production system. The start times of preventive maintenance actions and their number are not fixed in advance but considered, with the execution dates of production tasks, as decisions variables of the problem. The solution of the integrated model is based on multi-objective ant colony optimization approach. The proposed algorithm (Pareto ant colony optimization) is compared, on the basis of several metrics, with well-known multi-objective genetic algorithms, namely NSGA-II and SPEA 2, and a hybrid particle swarm optimization algorithm. Interesting results are obtained via empirical study