**Highlights**

* Study focus the feeding potential of *O. strigicollis* predatory stages (i.e., third instar, fourth instar, fifth instar, male and female) on *P. gossypiella* eggs and first instar larvae.
* Study focus the fitness traits of *O. strigicollis* feeding on *P. gossypiella* eggs at three temperatures (24, 28 and 32°C) in laboratory that have not been tested before.
* Study focus the prey preference of *O. strigicollis* predatory stages (i.e., third instar, fourth instar, fifth instar, male and female) on *P. gossypiella* eggs and first instar larvae.
* The value of population parameters i.e., intrinsic rate of increase (*r*) and the net reproductive rate (*R0*) was higher at 28°C that shows the more potential to survive and reproductive capability of bugs.
* The *P. gossypiella* eggs were more preferred stages than first instar larvae.