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Reduction of wild boar (*Sus scrofa* L.) damage in maize (*Zea mays* L.) by using castor (*Ricinus communis* L.) as barrier

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Abstract

Wild boar (*Sus scrofa*) is considered as important agricultural pest in India. Its status and distribution across the country is fragmented with high density populations and causing considerable damage in different growth stages. Among the crops, maize is highly preferred by the wild boar and the damage was significantly higher during sowing and dough/milky stage (10-75%) of the crop. The basic reason for such unexpected abrupt rise in their populations can be attributed in escalating rate of deforestation, non availability of preferred dietary items, and less predatory pressure. This resulted in to severe man-animal conflict. In the present study use of high density planting of Castor crop as border/barrier resulted in increase of yield from 36.24 to 95.29% and minimized wild boar entry in to the maize fields.

Keywords: Wild boar, maize, damage, castor, reduction, farmer-animal conflict

Introduction

Wild boar (*Sus scrofa*) is a key species in many habitats due to its feeding nature it regulates unwanted plants, tubers, insects, and mushroom species and helps in vegetation renewal by soil aeration [6]. Due to indiscriminate destroying of preferred habitats and poaching the populations of wild boar are isolated and fragmented. These isolated populations became locally abundant, non-availability of preferred food forced them to depend upon agricultural crops. This behaviour resulted in non-acceptance by people, developed an antagonistic attitude towards the wild boar and is affecting the conservation efforts [11, 12]. Wild boar is distributed in almost all the states of the country and as per IUCN wild boar listed under least concern, whereas in IWPA it is under Schedule III. Wild boars are in general social animals and always move in groups. The home range of the wild boar is dependent upon the distribution and availability of food, water and shelter. Group size, habitat disturbance and predation will also influence home range size. They feed and rest in small groups, though the adult males usually forage individually. The animal is sensitive to intense sun because of the presence of fewer sweat glands, due to that during the day they spend their time in the dense cover near water. Hence, their activity is more during early morning and evening, peculiarly active at dawn & dusk than in the actual day period. They have also a unique feature of identifying cropped areas through their smell sensory mechanism [10, 9]. They are omnivorous, consume a wide variety of food items, mostly depend on a vegetarian diet which consists of seeds, fruits, leaves, tubers, bark of the trees, fungi etc. Carrion, bird's eggs, reptiles and insect larvae also are eaten [8, 1].

Wild boar has been regarded as a serious pest of agriculture crops and more pronounced in crop fields which are in close proximity with adjoining forests areas. Wild boar is a major problematic species in the agricultural crops in many parts of India, raid crops and utilises the agro-ecosystem for food and shelter [4]. The problem of crop damage by wild boars has been widely reported from Rajasthan and Madhya Pradesh and Telangana [3, 7, 12]. Earlier estimates from the college farm, ARS Thandur and some selected farmers' fields of southern Telangana, the wild boar damage in maize is approximately 10 – 75 percent during the sowing stage to maturity stage [11]. The incidence of crop damage intensively seen in all growth stages of the crops, intensity of crop damage is mostly depended on availability of the food, crop type, extent of the area, population density, season, predatory pressure, climatic conditions and physiological status of the animal.

The damage pattern also observed to be more in rabi than *Kharif*. This paper presents the findings and mitigation strategies of our study to prevent the wild boar damage in maize crop in Telangana state. Maize is one of the important food crops in Telangana state. Due to high nutritious value which is used in most of the food products, apart from using as food it is also used as dhana in the poultry industry, fodder for cattle and as raw material in many industries after gaining importance from World Trade Organization (WTO) it got high exporting capacity. It is mainly rain fed crop, every year it is cultivated approximately 2 to 4 lakh hectares in Telangana³. Until now, farmers have used many different traditional measures^[11] and some physical barriers^[12] to reduce damage to cultivated crops by wild boar. Though the physical barriers like Circular razor wire and chain link fence were proved effective in controlling wild boar, it is expensive for the small scale farmers. Keeping in view, alternative cost effective solutions are very much needed to prevent damage by wild boar in maize. We have designed and conducted field experiments in various maize fields, by using castor as border crop around maize against wild boar.

Materials and Methods

The field experiments were conducted at Agricultural Research Station, Tandur (17.227161 N, 77.586547 E), for four years (from 2011 to 2015) during both *Kharif* and *Rabi* seasons using high density planting of castor around maize. Castor is an important non-edible oilseed crop and is grown especially in arid and semi arid region. It is originated in the tropical belt of both India and Africa. It is cultivated in different countries on a commercial scale, of which India, China and Brazil are major castor growing countries accounting for 90 per cent of the worlds production. Historically, Brazil, China and India have been the key producing countries meeting global requirements^[5]. Damage in castor by wild boar is not possible due to the non-palatable nature of the plants with high amount of alcohodies, glucosides and the most notorious constituents like protein ricin and the alkaloid ricinine, a deadly poison found in abundance in the seed and in smaller amounts throughout the plant^[2]. Usage of castor as border crop is practicable in both *Kharif* and *Rabi* seasons and the same crop can be used as border crop in crops like pulses and other oil seeds. In the present experiment castor crop is planted in 4-5 rows with close spacing (high density with row to row 45cm and plant to plant 15cm) around the maize (Figure 1). Approximately 1km distance between control and experimental plots were maintained in all the years of study and size of the experimental and control plots are 2000 Sq mt. The main focus of this experiment is, wild boars being capable of identifying the crops only through smell, they can't do so owing to the strong odour emitted by the castor, which is successfully masking the odour emitted by the maize crop.

Results and Discussion

In the present study castor as a border/barrier crop around maize proved effective in controlling of wild boar entry. The experiments were repeated in different years in *rabi* season, once in *kharif* season and the yield data in all the year of study were significantly higher in the experimental plots than control plots. The year wise data clearly showed variations in yield and the results are as follows; during the year 2011 – 12 *Rabi* experimental plot yielded 2346 kg/ha when compared to control 463 kg/ha. During the year 2012 – 13 both *Kharif* & *Rabi*, the experimental plots yielded 2088 kg/ha and 1941.4

kg/ha respectively, whereas, in control plots the yield was 823 kg/ha and 908.5 kg/ha during *Kharif* & *Rabi*. During the year 2013 – 2014, the experimental plot showed high yield 5524.79 kg/ha, when compared to control plot 133.34 kg/ha during *Rabi*. In the year 2014 – 15 experimental plot yielded 4615.6 kg/ha against control 1640.6 kg/ha during *Rabi* (Table 1). Paired sample T test was performed during *Rabi* to test the significance between experiments and controls, the statistical test showed that the experimental results were significant at 95% confidence interval ($t=2.986$, $df=3$, $p<0.05$).

The percent damage of crop in control plots was noticed from 53.20% to 97.59%. During the period of study, the percent damage was recorded high during the year 2013 -14 (97.59%), followed by 2011-12 (80.26%), 2014-15 (64.46%) and less damage was noticed during the year 2012-13 (53.20%) (Figure 2), whereas, in 2012-13 *Kharif* the damage percent was noticed to the extent of 60.58% in control plots. Though, the experiment was effective in controlling of wild boar, however, some incidences of damage were recorded in the experimental plots also and the percent damage has ranged between 4.85% to 15.42%. Maximum percent damage was recorded during the year 2013-14 (15.42%), followed by 2012-13 (12.38%), 2014-15 (8.63%) and minimum damage to the crop was noticed in the year 2013-14 (4.85%) (Figure 3), whereas, in *Kharif* 2012-13 the damage percent was noticed to the extent of 9.62%.

The percent increase in yield by using castor border treatment during the study period was highly significant as compared to the control. The highest percent increase in yield during 2013 - 14 over control was 95.29% followed by 2011-12 (67.03%), 2014-15 (47.55%) and 2012-13 (36.24%) (Figure 4). The difference in the yields during the study period mainly on account of different agronomical practices, crop variety and other disturbances like chasing, deterring and availability of food in the vicinity areas to the animals.

The earlier studies conducted by Rao *et al.*^[11], traditional management methods for controlling of wild boar in agricultural crops are not up to the mark and gave relief to the farmers to some extent. Simultaneously, another study by Rao *et al.*^[12], Efficacy of different Physical Barriers around Maize crop at the Southern Telangana zone, showed using of the physical barriers like circular razor wire showed significant increase in percent yield (30.8%), followed by chainlink fence (28.3%), barbed wire fence (27.0%) than control (14.0%). Though these methods are effective in controlling the wild boar but involved in high cost and non-feasible to practice by marginal farmers. Comparing to the earlier methods, the present study using castor as border crop showed effective results in the control of wild boar and significant percent increase in yields up to 95.29% against the control. This method is eco-friendly, easy to practise by farmers and also ensure to get additional income. This method also attracts pollinators and they remain for longer periods in the region. Hence, by using of this method castor area can be increased in the wild boar affected regions.

Table 1: Year wise yield in the experimental and control plots

S. No	Year	Yield Kg/ha			
		<i>kharif</i>		<i>Rabi</i>	
		Exp	Cont	Exp	Cont
1	2011-12	-	-	2346	463
2	2012-13	2088	823	1941.4	908.5
3	2013-14	-	-	5524.79	133.34
4	2014-15	-	-	4615.6	1640.6

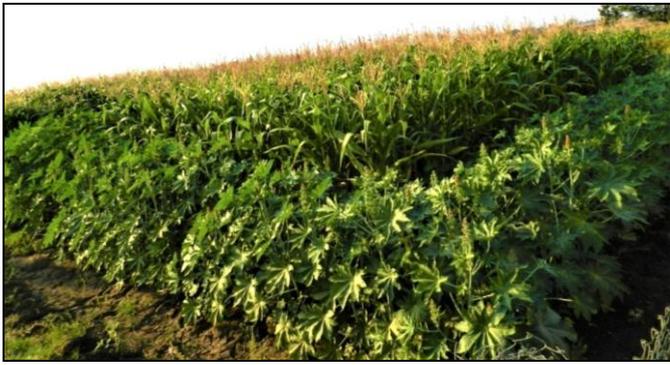


Fig 1: High density Castor as a barrier crop around Maize

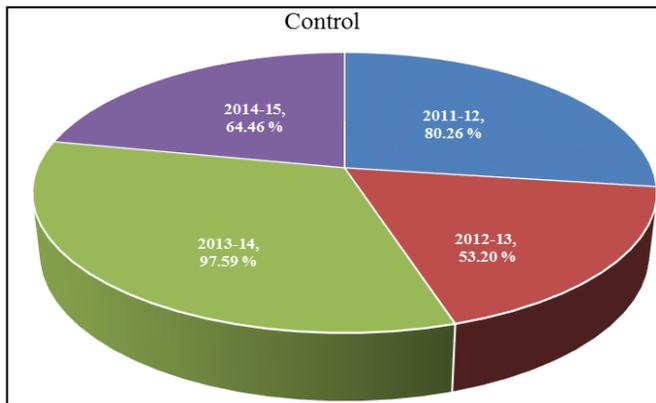


Fig 2: Showing the percent of damage in control plot

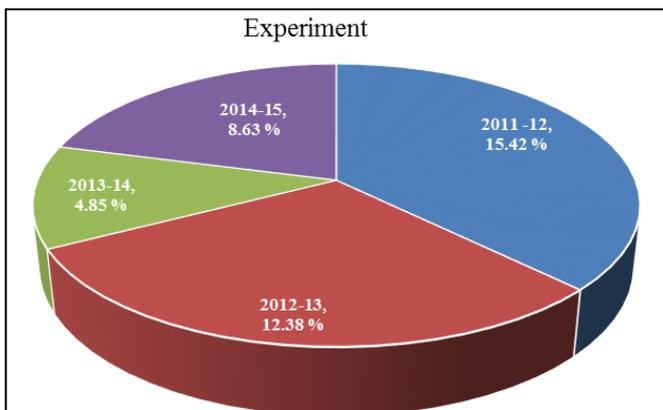


Fig 3: Showing the percent of damage in experimental plot

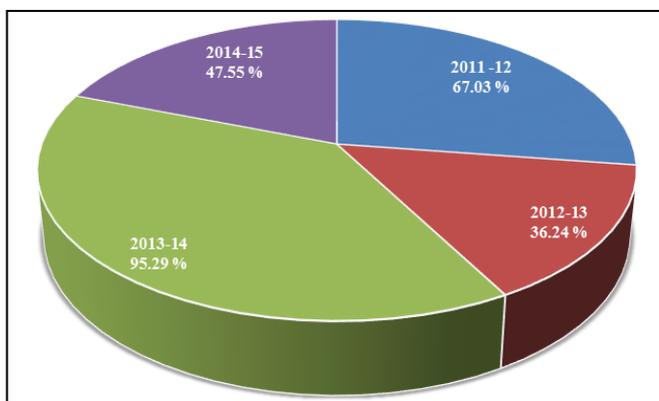


Fig 4: Showing the percent increase of yield over control

Conclusion

In the present study castor as a border/barrier crop significantly reduced the wild boar damage in maize to the extent of 74%. Apart from the main benefit the farmers also assured with additional income through the castor yields. This

practise also helps in creating awareness among the farming community about the role of castor in controlling the wild boar damage and also the importance of castor as an alternative crop for reducing wild boar menace. Through Agriculture extension agencies, this method can be demonstrated in farmers’ fields and the extent of the castor area can be increased across different agro climatic zones of the country.

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