

Research Application Summary

**Performance of Wild Blackberry species in Kenya under conventional production**

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**Abstract**

Blackberry (*Rubus* L. sub-genus *Rubus* Watson) fruits grow wild in Kenya, though in some parts of the world they have been domesticated and are cultivated. There is potential for their adoption in Kenya, however this requires that information is available about the growth, yield and quality of fruits. Four wild blackberry species were investigated, i.e., *Rubus volkensis*, *Rubus steunderi*, *Rubus apetalus* and *Rubus pinnatus*. One cultivated species *Rubus fruticosus* was included for comparison. Of the four species *Rubus apetalus* had the highest numbers of branches, the highest number of canes emerging from the ground, and also the largest cane diameter. *Rubus fruticosus* had the highest number of flowers and fruits while *Rubus apetalus* had flowers. The other three species had not flowered by the time data were collected. It is expected that the findings of this study will not only contribute to the scientific knowledge in the area of wild blackberry production but also in enhancing and promoting its cultivation.

Key words: Blackberry, conventional production, Kenya, *Rubus apetalus*, *Rubus fruticosus*, *Rubus pinnatus*, *Rubus steunderi*, *Rubus volkensis*

**Résumé**

Les fruits de la mûre (*Rubus* L. sous-genre *Rubus* Watson) poussent de façon sauvage au Kenya, bien qu'ils aient été domestiqués et cultivés dans certaines parties du monde. Il y a du potentiel pour que leur adoption soit également possible au Kenya, mais il faut disposer d'informations sur la croissance, le rendement et la qualité des fruits. Quatre espèces de mûre sauvage ont été étudiées, à savoir *Rubus volkensis*, *Rubus steunderi*, *Rubus apetalus* et *Rubus pinnatus*. Une espèce cultivée *Rubus fruticosus* a été incluse à titre de comparaison. Parmi les quatre espèces, *Rubus apetalus* avait le plus grand nombre de branches, le plus grand nombre de cannes émergeant du sol et le plus grand diamètre de canne. *Rubus fruticosus* avait le plus grand nombre de fleurs et de fruits alors que *Rubus apetalus* avait des fleurs. Les trois autres espèces n'avaient pas fleuri au moment où les données ont été recueillies. On s'attend à ce que les résultats de cette étude contribuent non seulement aux connaissances scientifiques dans le domaine de la production de mûre sauvage, mais aussi à l'amélioration et à la promotion de sa culture.

Mots clés: Mûre noire, production conventionnelle, Kenya, *Rubus apetalus*, *Rubus fruticosus*, *Rubus pinnatus*, *Rubus steunderi*, *Rubus volkensis*

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## Background information

Blackberries (*Rubus* L sub-genus *Rubus* Watson) are important fruits referred to as “super fruits” and are second most important fruit after Blueberry (*Vaccinium* sp.) among the berry fruit species (Tulipani *et al.*, 2008). Blackberries are cultivated on over 20,000 ha, mainly in Europe and North America (Strik *et al.*, 2007). They belong to the genus *Rubus* that comprises a high diversity of species such as *R. ursinus*, *R. fruticosus* and *R. argutus* and are among the soft and aggregate fruits which are highly regarded for their health and nutritional qualities (Pamfil *et al.*, 1996). Blackberry is a fruit of mild climate and can easily adapt to different ecological conditions. The plant grows very fast in woods, scrubs, hillsides, hedge rows and colonize large areas in a relatively short time. They are also more tolerant to drought and warm conditions than raspberries (Crocker *et al.*, 1998). It flowers and ripens to produce purple, black and red coloured blackberry fruits. According to Chittaranjan (2011), there are 84 wild species of wild blackberries in Kenya. Blackberries have now become a common fruit in marketing outlets, particularly in North America and the European Union and it has enjoyed expansion due to a combination of factors including improved cultivars, expanded marketing efforts and fruit availability (Strik *et al.*, 2007). However, locally in Kenya there is limited information on the performance of the wild blackberry species in comparison to the cultivated types that were imported. As such their optimal growth, fruit yield and quality are not known as they grow wild in various parts of the country without cultivation. The aim of this study is to evaluate the performance of four wild and one cultivated blackberry species, in terms of their growth, fruit yield and quality. This would facilitate identification of wild blackberry species that have comparative advantage over cultivated species or vice versa and may provide new option for further improvement through plant breeding.

## Literature Summary

*Rubus* berry species are narrowly related to roses, one of the most diverse genera in the plant kingdom. The *Rubus* plants vary from completely self-unfruitful and are often referred to as brambles. Bramble fruit are separated into two groups: raspberry and cultivated blackberry (*Rubus idaeus* L. and *Rubus fruticosus* L.) (Industries, 2002). Blackberries are often classified according to their cane architecture into three types: erect, semi-erect, and trailing (Strik, 1992). The centre of diversity of *Rubus* is considered to be in China, where there are 250-700 species depending on the taxonomists. Thompson (1997) and Roach (1985) have given extensive accounts of early domestication of *Rubus*. Records were found in the 4th century writings of Palladius, a Roman agriculturist about *Rubus*. Seeds have been discovered within Roman forts in Britain. Species in the *Rubus* genus are indigenous to six continents and grow from the tops of mountains to the coastal locations (Daubeny, 1996). They grow especially well as cool climate plants, but will also produce worthwhile crops in the subtropics. The European blackberry (*Rubus fruticosus* L.) is centred in the Caucasus region and has been introduced into Asia, Europe, North and South America, and Africa. They grow

vigorously and rapidly in woods, scrub, hillsides, and hedgerows and blackberry shrubs. They tolerate poor soils and they readily colonize wasteland, ditches, and vacant lots (Huxley, 1992). Wild blackberry species growing in Kenya can be categorised into four groups (See Table 1).

<b>Blackberry category</b>	<b>Description</b>
<i>Rubus apetalus</i>	It is a scrambling prickly shrub, branches are hairy, armed with hooked prickles, leaves with 3-7 leaflets, each ovate, hairy, pale green beneath with serrated margins. Flowers are white to pink and fruits are green, turning yellow to purple-black on ripening. It is widely distributed in Kenya in riverine vegetation, forest edges, humid bushland and hillside springs. Fruits are edible with a sweet acid taste and it has potential for use as a hedge and an ornamental (Maundu <i>et al.</i> , 1999).
<i>Rubus pinnatus</i> Wild	It is a prickly scrambling shrub, branches occasionally white, armed with hooked prickles, leaves with up to nine leaflets, each ovate with serrated margins, flowers are white to pink and fruits turning reddish black on ripening. Found in tropical Africa to South Africa, it is widely distributed in Kenya in Riverine vegetation, near hillside springs and forest edges. It is used as food as the fruits are edible and sweet and may be used as hedge plant (Maundu <i>et al.</i> , 1999).
<i>Rubus volkensis</i> Engl	Prickly shrub up to 4 m, stems with hooked prickles, covered with brown sticky hairs, leaves are compound with up to 7 leaflets, the stalks and rachis, leaflets hairy, with serrated margins, top leaflets often incompletely divided. Flowers are yellow-white, borne in panicles. Fruits turn orange to red when ripe. They are found growing in Limuru, Lari and Aberdares in high altitude forest edges and bushland and bamboo margins. Its fruits are edible and delicious (Beentje, 1994; Maundu <i>et al.</i> , 1999).
<i>Rubus steundneri</i>	The stem are alined with small, but sharp prickles, and the numerous weak stems bend and lean against themselves and other plants. They form an impenetrable thicket that getting to the edible berries can be an arduous task (Michael, 2014).

### Study Description

The study was conducted at the Horticulture Research and Demonstration Field of Egerton University. The site is situated within Rift Valley province at approximately 175 km North-West of Nairobi. The farm lies at a latitude of 0°23' S longitude 35°35' E and an altitude of 2238 m. The area receives a total annual rainfall ranging from 1200 to

1400 mm while average maximum and minimum temperatures range from 19°C to 22°C and 5°C to 8°C, respectively. The soils are well drained dark reddish clays classified as Mollicandosols (Jaetzold and Schmidt, 2006). This study entailed an evaluation of the performance of four wild blackberry species (*Rubus volkensis*, *R. steundneri*, *R. apetalus* and *R. pinnatus*) under conventional conditions, and a cultivated species, *R. fruticosus*. The experiment was laid out in a Randomized Complete Block Design (RCBD), with three replications. The four wild species were collected from the wild identified and propagated through stem cuttings and later planted in the main field. Data were collected on: number of branches, cane diameter, number of canes emerging from the ground, number of flowers and number fruits. Data were subjected to analysis of variance (ANOVA) using the general linear model procedure of the statistical analysis system (SAS) program (SAS institute Inc, 2007). Significant means were separated using Tukey's honestly significant difference (Tukey's HSD) test ( $P \leq 0.05$ ).

### Results/Research Application

Results showed that *R. apetalus* had the largest cane diameter (14.5 mm) followed by *R. volkensis* (11.97 mm), *R. fruticosus* at (9.83 mm), *R. pinnatus* at (8.50 mm) and lastly *R. steundneri*. All these cane diameters were not significantly different. Further *R. volkensis* had the highest number of branches (12.17), followed by *R. apetalus* (10.42), *R. steundneri* (7.67), *R. fruticosus* (5.08) and lastly *R. pinnatus* (4.32). The number of branches in *R. volkensis*, *R. apetalus* and *R. steundneri* were significantly different at  $P < 0.05$ .

The numbers of canes emerging from the ground were highest in *R. apetalus* (7.67) and least in *R. fruticosus* (2.83). The number of flowers on the other hand were highest in *R. fruticosus* (10.33) followed by *R. apetalus* (8.33). These were not significantly different from each other (Table 1). The other two wild *Rubus* spp. had not produced flowers by the time data were taken.

The results on the number fruits formed showed that only *R. fruticosus* had fruits at the time of data collection. This species had a mean of 14.5 fruits / plant.

**Table 1:** Cane diameter, number of branches, number of canes number of flowers and number of fruits amongst four blackberry species.

Blackberry species	Cane diameter (mm)	Number of branches	Number of canes	Number of flowers	Number of fruits
<i>Rubus apetalus</i>	14.50a	10.42a	7.67a	8.83a	0b
<i>Rubus steundneri</i>	8.43a	7.67ab	4.67ab	0b	0b
<i>Rubus volkensis</i>	11.97a	12.17a	4.02b	0b	0b
<i>Rubus fruticosus</i>	9.83a	5.08b	2.83b	10.33a	14.50a

Means followed by the same letter(s) within a column are not significantly different at  $P \leq 0.05$  according to HSD Turkey's test.

## Discussion

The results from the ongoing research showed that *R. apetalus* was the most vigorous among wild *Rubus* spp. in terms of growth. It had the largest cane diameter and the highest number of canes emerging from the ground. This can be attributed to its wild nature of growth and adaptation to the area. Cangı and Islam (2003) reported cane diameter range of 3.49 - 7.99 mm among different cultivars of blackberry. In terms of branching, *Rubus volkensis* was the most vigorous of all species followed by *R. apetalus*. *R. fruticosus* was the least vigorous, it had the least number of branches and number of canes emerging from the ground. However it had the highest number of flowers and was the only one that formed fruits among the test species. This could be attributed to the selection it has undergone in the breeding program.

Wild blackberry *R. pinnatus* and *R. steudneri* were not very vigorous compared to the two wild species *R. volkensis* and *R. apetalus*. These two had a slow growth rate which could have been due to environmental effects (Facteau *et al.*, 1986; Eyduran *et al.*, 2006).

## Ongoing Research

Presented above are preliminary results of an ongoing research. Yield and fruit quality will be collected in due course. It is expected that after this study, a wild blackberry species with potential of being adopted will be identified.

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