Many bird species show advancing breeding phenology in the Northern Hemisphere and this can be linked with climate change. For example, Dunn and Winkler[20] demonstrated that tree swallow (*Tachycineta bicolor*) shifted significantly average breeding date nine days earlier than normal in North America. In Europe, McCleery and Perrins[21] found that clutch initiation date in the great tit (*Parus major*) advanced as a response to spring warming in the United Kingdom. The present study is based on the results of 37-year monitoring of the European starling breeding population in northwestern Croatia. Results indicate that the studied bird species began to lay eggs approximately eight days earlier in the researched area, in the period between 1980 and 2016. Conversely, according to Flux[22], the European starling population tended to breed successively later, and Dolenec[23] reported not-significant trend. Svensson[24] found low significant tendency towards earlier laying date of the European starling at five locations while at the other eight locations studied, no significant differences in laying date were detected. Nevertheless, different populations of the European starling show various responses to climate change. Difference in breeding phenollogy response has also been documented in other bird species[25]. The European starling population in northwestern Croatia is possibly following the food peak, as demonstrated by Visser *et al.*[26] for the great tit. According to these authors, timing of breeding shows corresponding year-to-year fluctuation, caused by phenotypic plasticity. According to Pautasso[27], further climate change could have a major impact on birds in many different ways; for instance, body size change or mismatches with their resources. Thus, future studies should consider possible interactions among these levels in order to devise effective conservation strategies.

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Simple estimates for optimization of potassium nutrition in vineyards

Nutrient management, amount and application, is one of the most important aspects in agriculture, more so in horticultural crops which are usually heavy nutrient feeders. Nutrients affect quality and quantity of produce, but their injudicious use in the form of fertilizers results in soil and water pollution, thus damaging natural ecosystems which thrive therein[1–4]. Grape is one of the oldest cultivated crops of the world[5] and its adoption in India dates back to 1356–1220 BC (ref. 6). Cultivated grapevine area in India is currently at 122,000 ha with grape production touching 3.2 million tonnes (Mt). Grape is grown as a subtropical crop in Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and western part of Madhya Pradesh. Grape plantations fetch higher yield and more income than most other field and fruit crops[7]. Good yield and better quality, together, are key drivers for optimum crop nutrition plans for vineyards. Optimization of nutrient application in vineyards, especially for potassium, is needed most as it accounts for a major portion of input costs.

Potassium not only plays a significant role in growth of vines but also the quality of grapes and grape juice, and therefore K nutrition draws significant attention of farmers. Potassium is involved in regulating the osmotic potential of cells, and in maintaining the turgor of the guard cells that help in opening and closing of the stomata[8]. It is known to increase radial growth, shoot diameter and leaf dry matter of vines[9]. It also favours formation of inflorescence[10] and increased bud fertility through increased accumulation of carbohydrates[11].Yield parameters such as bunch number per vine[10], bunch size and total fruit yield[12] have been reported to increase with increased K application. In one of the estimates, K contributed to as much as 19% of total yield in a common variety[6]. K-nutrition even at harvest has provided attractive look to bunches and enhanced shelf-life[10,13]. Activation of essential enzymes for photosynthesis, respiration and production of ribose sugars[14], starch and proteins[15] are regulated by potassium. It also plays a vital role in regulating acidity of juice, total soluble solids content and anthocyanin levels.

Grape growers need to assess K requirement of vines before deficiency symptoms appear, and well before losses occur in terms of quality and quantity of grape yield. At present, fertilizer applications are based on the general fertilizer recommendations without much emphasis on how much is actually present in the soil pool, or how much is removed by harvested crop parts. Only a few of the grape growers apply potassium based on soil K status and/or petiole K content. Knowing K content in petiole or as available in the soil has little relevance to the farmer until it is translated to actual K-fertilizer requirements for a vineyard. Determining the amount of K fertilizer to be applied based on soil available-K or petiole-K is also not simple. This is the reason why grape growers often adopt general recommendations and end up applying either insufficient or excess of potassium. These diagnostic tools may not provide complete information until they are used together. The doses recommended for a particular vineyard would depend on its soil and petiole K content. The exact amount of K-fertilizer to be applied can be determined based on the optimum levels of K in soil and plant, and targeted grape yields. Deriving the optimum levels in plant tissue and soil by comparing them with applied-K and grape yields would solve this problem and help develop K-nutrient management. However, these optimum levels can still be affected to a small extent by such variables as rainfall, soil moisture[11] and soil texure[16]. However, from a broader perspective, variations may be minimized to achieve good results. A range would serve the purpose as long as it serves both ends, better yield to farmer and reduced environmental losses.

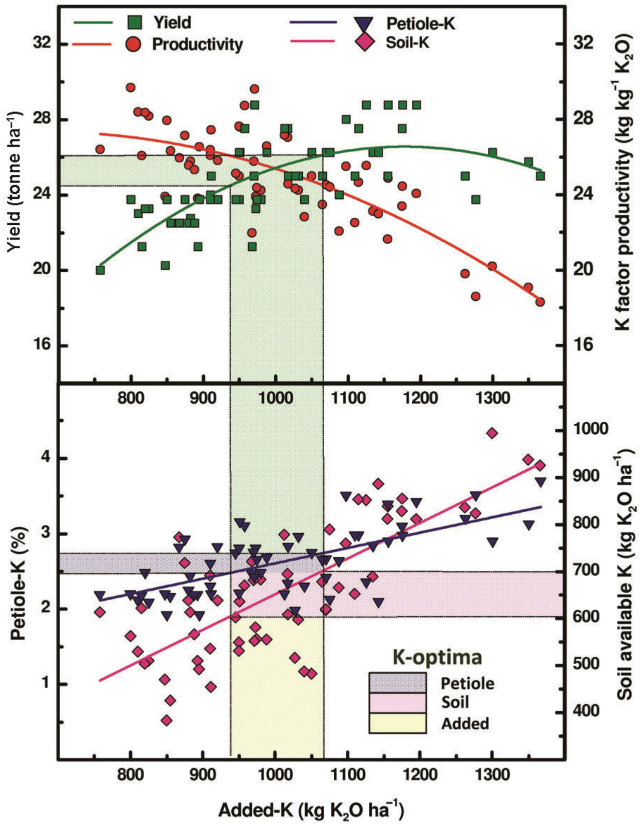

Figure 1. Response of grape yield and productivity to potassium nutrition, and its relations with petiole-K and available-K in soil. (Intersection of yield and productivity identifies the level of K economic optimum. The optimum level of K application to vineyards was derived based on the economic optimum range to maintain petiole-K and soil-K at ideal levels.)

Surveys of 60 grape vineyards in northern Karnataka were conducted to examine the status of K nutrition in terms of K-application rates, available-K status, petiole-K content and productivity responses. It was observed that the farmers applied K-fertilizers based on three key parameters: available-K status, petiole-K content and K-recommendations provided by State Departments (often used alone and rarely together). Currently, K-recommendation for grapes is 1000 kg ha^{-1} (ref. 17). The survey revealed that there was hardly any farmer who exactly applied 1000 kg ha^{-1} (Figure 1). The rate of application of K fertilizer ranged from 750 to 1370 kg ha^{-1}. Available-K status in soils varied between 400 and 1000 kg K_2O ha^{-1}, as the area covering the study was large with diverse soil conditions. Based on best-fit regression relationships, it was observed that yield followed a nonlinear positive relationship with fertilizer K-application. In contrast, productivity showed a nonlinear negative relationship. Available-K status and petiole-K content changed linearly with fertilizer application. Economic optimum yield range was derived based on the yield and productivity interception point ±1/3 of standard deviation of whole population; it was found to be 24.7–26.1 tonne ha^{-1}. Extension of this range to 'petiole K versus added K' and 'available-K versus added K' regression lines yielded optimum ranges for petiole K and soil K as well as optimum range for application of K (Figure 1). The study suggested that optimum grape yield can be obtained at optimum range for soil available-K between 610 and 705 kg K_2O ha^{-1}, petiole-K between 2.50% and 2.75%, and fertilizer applied-K between 970 and 1045 kg K_2O ha^{-1}. Farmer can choose one or more of these criteria in K-nutrition to obtain the best results.

Most of the farmers in the study area either relied on conventional knowledge or approached not very professionally skilled consultants (many a times fellow farmers). Owners of the high-output vineyards tend to use higher rates of K fertilizers, primarily to improve fruit quality. It appears that the economic conditions of farmers played small role in deciding the rate of K-fertilizer application. It was mostly the awareness that a farmer did not have about optimum ranges for soil, petiole and yield which could be achieved with proper fertilizer application. The K-optimization goals proposed in this study are easy to follow. Multiple parameter ranges as suggested in this study would also provide an opportunity to influence more growers to adopt these optima, since farmers do not seem to be much aware of diagnosis techniques, nor do they have access to expert consultancy. This study brings out clear and simple ranges for diagnostic parameters used for K fertilization in the country which are easier for farmers to follow and maximize returns from their vineyards.

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Brainea insignis (Hook.) J.Sm. – a conservation priority fern of North East India

A false tree fern, *Bowringia insignis* Hook., was described by Hooker[1] as a new genus to honour John Bowring and his son, J. O. Bowring, who first sent live plants of it from Hong Kong for introduction to the Royal Botanic Garden, Kew, London. Taxonomically *Bowringia* Hooker (1853) was an illegitimate later homonym of *Bowringia* Champ. ex Benth. (1852, Fabaceae) and a new name, *Brainea*, was therefore proposed for this ferngenus to honour J. C. Braine[2], who had also introduced it at Kew in 1850.

Brainea is a monotypic genus of false tree ferns represented by *Brainea insignis* (Hook.) J.Sm. (family Blechnaceae). The plant has a thick, upright or ascending, slow-growing trunk which may attain a height up to 1 m. The apex of the trunk bears a compact radiating basket of many fronds giving the appearance of a cycad; hence it is often called 'cycad fern' in the nursery trade. The individual plants are scattered in often large colonies on open or semi-shaded slopes. Like cycad, *Brainea* is also a perennial plant; it can survive for several years and thrive in warm and exposed places. The fronds are unipinnate with long, narrow, pointed, glossy green pinnae which are light green or glaucous white on the under surface. The naked sori are produced on the under surface of leaf segments in a line along the reticulate veins (Figure 1).

B. insignis is a native to Southeast Asia (India, Myanmar, Malay Peninsula, Philippines, Thailand, Taiwan, Vietnam, Indonesia, Sumatra and south China)[3,4]. North East India is its westernmost limit,