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Evaluation of Field Performance of BEST Aeolian Sediment Catcher in Sandy-loam Soil of Arid Zone of Turkey

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Abstract

Başaran M., Uzun O., Erpul G. (2017): Evaluation of field performance of BEST aeolian sediment catcher in sandy-loam soil of arid zone of Turkey. Soil & Water Res., 12: 96–105.

Field measurement of wind erosion is still a great challenge for researchers. In this study, field performance of a newly designed sediment trap BEST (Basaran and Erpul Sediment Trap) was evaluated for the first time and compared with the commonly used Modified Wilson and Cook (MWAC) traps. Experiments were carried out at the Karapinar Research Station of Konya Soil and Water Resources Institute over the 50 × 50 m tilled sandy loam plot. Three wind erosion events occurred during the experiments. A small amount of sediment was trapped by the MWAC traps only at 0.20 m in all three events, and there were not sufficient sediment measurements at the catch heights to obtain vertical mass flux profiles. On the other hand, BEST was able to catch sufficient amount of sediment at each trap height to calculate soil losses from the experimental fields. Besides, an analysis for particle size characteristics by electron microscopy imagery indicated that almost all of the sediment particles trapped by BEST at any height above 0.60 m were smaller than 100 mm. Hereby, during three erosive wind events a better performance of BEST than of MWAC at comparable catch heights was verified.

Keywords: sediment trap; trap efficiency; wind erosion

Soil erosion is the most significant environmental problem very common in the lands of arid and semi-arid regions. Many wind tunnel and *in situ* wind erosion studies were conducted to highlight the importance of wind erosion effects on soil and land degradation in arid and semi-arid regions of the world (Lozano *et al*. 2012; Burri *et al*. 2013; Wang *et al*. 2013; Zhang *et al*. 2014). Although water erosion generally seems to be dominant, wind erosion continues to be a major cause of soil degradation in semi-arid Turkey. Abali *et al.* (1986) indicated that in Turkey wind erosion affects an area of 465 000 ha.

Youssef *et al*. (2009, 2010) conducted *in situ* measurements in Karapinar to introduce scaling up of a field process-based wind erosion model to a regional scale and to validate wind erosion models using ground data at regional scale. The results revealed that additional direct measurements were required to have a clear view on wind erosion distribution throughout the Karapinar region and on interactions between wind erosion and land use. During the study in Karapinar, it was also reported by Youssef *et al.* (2009) that there were five wind events observed within a month (March of 2009) during which, although many dust events occurred, the Modified Wilson and Cook (MWAC) catchers could hardly trap particles to ensure a mass flux evaluation with different catch heights. The MWAC catchers could collect only saltating sand-size particles moving closer to the soil surface (Youssef, pers. comm.).

Obviously, the ability of any catcher to characterize wind-blown particles is very critical for appraising aeolian processes. Therefore, direct soil erosion measurements have attracted the interest of several

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researchers during the last three decades. The Big Spring Number Eight (BSNE) trap (Fryrear 1986) and the MWAC trap (Wilson & Cooke 1980) are commonly used traps for sediment transport by wind.

Since the intensity of wind erosion significantly varies with macro and micro topography, plant cover, soil characteristics, and climate conditions, direct measurement of soil erosion is a hard-to-perform and an expensive task. In order to make this task much easier, several passive traps were developed and directly used in sediment trapping. They are mostly low-cost traps with different efficiencies and aerodynamic structures, having some advantages and disadvantages. One of the most significant drawbacks of these passive traps seems to be their inefficiency in catching the particles transported in suspension. Zobeck *et al.* (2003) indicated that passive sampling of suspended sediment was more difficult than sampling saltating sediment because fine suspended particles were easily carried by the wind stream and might not enter the sampler if it was not isokinetic. These smaller particles cannot be easily trapped by a screen or other physical barrier, as well. Thus, a reliable measurement requires using a trap efficient enough to trap characteristic particles of different sizes.

The Basaran and Erpul Sediment Trap (BEST), designed based on cyclone technology, suggests a promising result in trapping sand and dust size particles during wind tunnel tests (Basaran *et al.* 2011). Aerodynamic structure and inside flow characteristics of BEST could significantly reduce its inlet static pressures, which were denoted as a main cause of lower efficiencies in passive traps, and the reduced inlet static pressures could remarkably provide a higher trap efficiency to catch both saltating and suspending particles (Cornelis & Gabriels 2003). The relationship between static pressure and efficiency was shown by wind tunnel experiments. Basaran *et al.* (2011) measured the efficiencies of the BEST and MWAC catchers for four different sand particle sizes (400–500, 200–300, 100–200, and < 100 μm) at four different wind speeds (12, 13, 14, and 15 m/s). The results revealed almost seven times higher efficiencies for BEST than MWAC for the particle size of < 100 μm, and the efficiency of BEST for < 100 μm was 75–90% while MWAC resulted in efficiencies about 10–20%. However, in previous studies, particularly with sand of relatively larger particle sizes, MWAC had much better efficiencies than those found by Basaran *et al.* (2011). For instance, Goossens *et al.* (2000) obtained efficiencies between 90 and 120% with the particles of 132, 194, and 287 μm using the wind speeds of 6.6 and 14.4 m/s in wind tunnel experiments. In another study performed with relatively lower wind speeds between 1.0 and 5.0 m/s, the efficiency of MWAC was measured as 95% with a soil containing 80% of silty loam (2–65 μm) (Goossens & Offer 2000). Conversely, Youssef *et al.* (2008) measured no particles smaller than 50 μm in the efficiency testing for MWAC, and its efficiency was 70% for the particle size of 400–500 μm for 13.3 m/s. Sterk (1993) determined the efficiency of MWAC as 50% in the wind tunnel experiments carried out by the different textured soils containing 92.2% sand, 3.0% silt, and 4.8% clay under the wind speeds ranging from 9.9 to 11.5 m/s.

So far, the studies have shown that the efficiency of MWAC trap could significantly change depending on the particle size distribution of test soils, and it appeared to have potential problems of trapping finer suspension sediments in spite of its good catch efficiency for sand size particles. On the other hand, wind tunnel studies indicated that the efficiency of BEST was good enough for the dust-sized particles (< 100 μm) (Basaran *et al.* 2011). In order to comparatively determine the field performances of the BEST and MWAC catchers over light-textured sandy soils, *in situ* measurements were made with an objective of confirming the results of the wind tunnel studies on the BEST efficiency.

MATERIAL AND METHODS

Site description. Karapinar is located in the Central Anatolia Region of Turkey. The experimental site has a semi-arid climate with an average annual precipitation of 275 mm, 40% of which falls during the winter months, and a monthly average precipitation of 15 mm between July and September. Indeed, the region is the driest part of Turkey. Based on the long term climate averages for the research site, values for temperature and wind speed are 12.8°C and 2.92 m/s, respectively.

Experiments were set up in the Karapinar Research Station of the Konya Soil and Water Resources Research Institute, on March 15th, 2010 (Figures 1 and 2). Large part of the station is used as the arid-region plantation and rangeland, on which grazing has not been allowed for years after preservation action. Experiments were set up at the rangeland following

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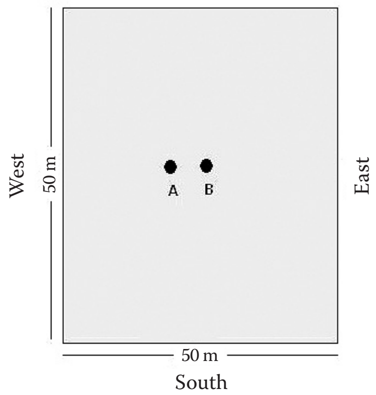

Figure 1. Relative positions of the Basaran and Erpul Sediment Trap (BEST – A) and Modified Wilson and Cook (MWAC – B) catchers in the experimental plot

Table 1. Selected physical and chemical characteristics of soils in the experiment fields of the Konya Soil and Water Resources Research Institute

Soil characteristics	Average	SD
pH (1:2.5)	7.67	0.08
EC (1:2.5) (dS/m)	0.26	0.04
Organic matter (%)	1.01	0.10
$CaCO_3$ (%)	66	0.80
Clay (%)	13	2.33
Silt (%)	13	1.17
Sand (%)	74	3.50
Aggregate mean weight diameter* (mm)	0.215	–
Share of aggregates < 0.84 mm* (%)	94	–

EC – electrical conductivity; SD – standard deviation; *Youssef *et al.* (2009)

a disturbance, for setting on wind erosion processes during the field research. Soil tillage was performed with a disk harrow over a 2500 m^2 land area, demarcating a square plot of 50 × 50 m (Figure 1).

Although the research site has a semi-arid climate, it has a very rich variety of plant species, with 227 plant taxa belonging to 41 genera and 177 species. The genera at the highest taxonomic rank are Poaceae (Gramineae) 29, Compositae (Asteraceae) 28, Cruciferae (Brassicaceae) 20, Chenopodiaceae 18, Leguminosae (Fabaceae) 16, and Labiatae (Lamiaceae) 15.

Soil characteristics of the experimental site. Soils of the Karapinar region are alluvial-originated and formed over ancient lake deposits. They are classified as Typic Xeropsamment (Soil Survey Staff 2006). Some soil characteristics of the experimental field are given in Table 1. Typically, the soils have a very low organic matter content, poor structure, low clay and silt content, and high sand content. More importantly, given the fact that the percentage of dry aggregates (< 0.84 mm) in the soil is 94% with a mean weight diameter (MWD) of 0.215 mm (Youssef *et al.* 2009), the site is very sensitive to wind erosion.

Description of the BEST and MWAC catchers. The cyclone BEST has a plastic body produced by a plastic injection system. It is mainly composed of three modular units: a lid including inlet and outlet, a cylindrical and conical cyclone body, and a collector (Figure 3a) (Basaran *et al.* 2011). All these units can be easily assembled and disassembled. Dimensional details of the cylindrical cyclone body, collector, and lid, with a tangential inlet port and a vertical outlet tube were described by Basaran *et al.* (2011).

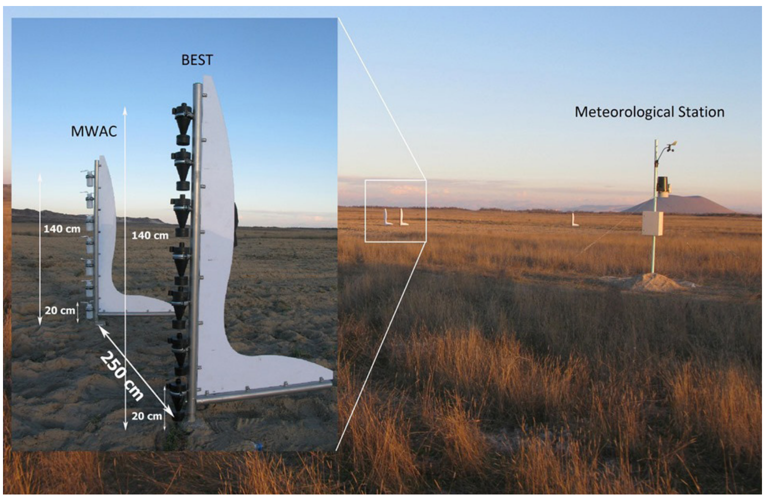

Figure 2. A view of the disturbed research plot to incite wind erosion during experiments with the Basaran and Erpul Sediment Trap (BEST) and Modified Wilson and Cook (MWAC) catchers along with a meteorological station

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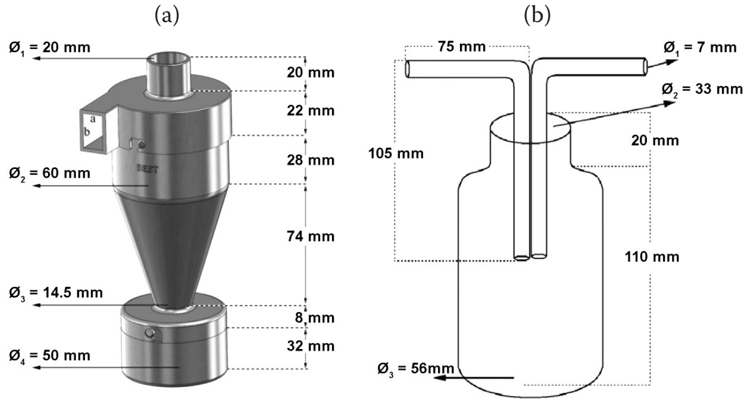

Figure 3. Design details of (a) Basaran and Erpul Sediment Trap (BEST) and (b) Modified Wilson and Cook (MWAC) trap used for *in situ* measurements

While outlet diameter is 20 mm ($Ø_1$), rectangular inlet has 12 × 20 mm in size. The diameter of the cylindrical body is 60 mm ($Ø_2$) and the base diameter of the conical body is 14.5 mm ($Ø_3$). Heights of the conical and cylindrical bodies are 50 and 74 mm, respectively. The diameter ($Ø_4$) and the height of collector are 50 and 40 mm, respectively.

The Wilson and Cooke trap (WAC) was originally designed by Wilson and Cooke (1980) and later on slightly modified by Kuntze *et al.* (1990) (MWAC). Details of the MWAC catcher used in our study are presented in Figure 3b. As a summary, the main body is made of plastic with a diameter of 56 mm and a height of 130 mm. Inlet and outlet are made of glass pipettes with a diameter of 7 mm.

Experimental design. The BEST and MWAC traps were mounted vertically on winged poles at 0.20, 0.40, 0.60, 0.80, 1.00, 1.20, and 1.40 m heights such that their inlets could face the prevailing wind direction by means of wings. Turning pole holders were spaced 2.5 m apart from each other to prevent one pole from possible effects of wind turbulence around the other pole (Figure 2).

Mass flux calculation. In the wind erosion process, eroded particles move not only by saltation and suspension, but also by creep. And, the value of modelled sediment q_o is directly related to the creep component of total wind erosion since creep particles have a diameter of 1 to 2 mm and roll along the ground. If the total sediment flux is under consideration, the rate of soil creeping away from the surface should be experimentally measured. However, the present research objective was not to estimate total wind erosion, but to assess field performances of the BEST and MWAC catchers, which proved to be good for catching particles transported by short-term suspension (~ 20–70 μm) and saltation (~70–500 μm). Therefore, a mathematical model was used to predict q_o instead of direct field measurement and experimentation.

Sediment flux (q_z, kg/m^2) at each trap height (z, m) was calculated by Eq. (1):

$$q_z = m/A \tag{1}$$

where:
m – sediment weight (kg) caught by each trap at a given height
A – inlet area (m^2) of a trap

Additionally, a prediction for sediment flux ($q_{z.\exp}$, kg/m^2) was made by modelling an exponential equation (Eq. (2), Figure 4) with every measured

$$q_{z.\exp} = q_o e^{-\alpha z} \tag{2}$$

where:
q_o – amount of sediment modelled at $z = 0$ (kg/m^2)
α – slope factor of exponential regression equation (m)

Subsequently, a sediment transport rate (Q_r, kg/m) was calculated by integration of $q_{z.\exp}$ (kg/m) predicted for set trap heights (Eq. (3)):

$$Q_r = \int_0^h q_{z.\exp} dz \tag{3}$$

where:
h – maximum particle transportation height (m) observed in each wind event
d – ???

Total mass transport calculation. Total mass transport (Q_t, kg/m) was calculated by the following equation (Eq. (4)):

$$Q_t = (\frac{Q_r}{\eta})L \tag{4}$$

where:
η – trap efficiency (0.80)
L – plot width (50 m)

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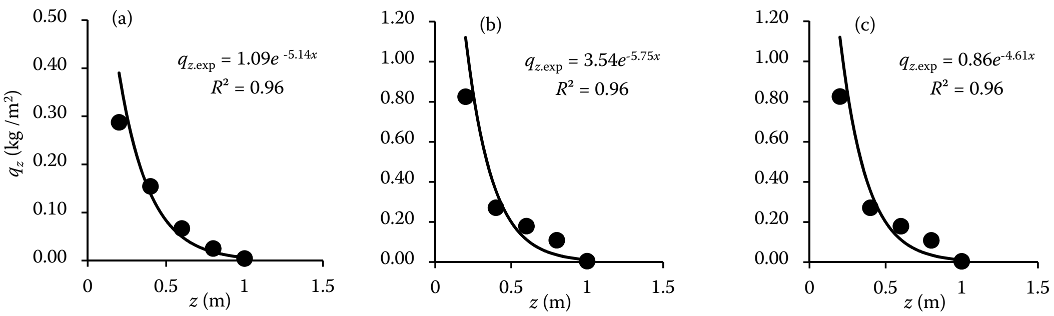

Figure 4. Predictions for sediment flux ($q_{z.exp}$, kg/m^2) by modelling an exponential equation (Eq. (2)) for (a) event I, (b) event II, and (c) event III

Efficiency of the BEST catcher was taken as 0.80 in calculations as suggested by Basaran *et al.* (2011), after a detailed set of wind tunnel experiments. Efficiency of the MWAC catcher could not be used because of insufficient measurements by the MWAC catchers with height to obtain a vertical mass flux profile.

RESULTS AND DISCUSSION

Three wind erosion events occurred in the Karapinar region during the period March 15th–April 29th, 2010 after the research had been set-up in the field. Climate data sets containing some wind erosion parameters for these events are summarized in Table 2 and Figure 5. The weather station in the region provided the data on changing wind speed hourly means (Figure 5) and the highest wind speed attained during each wind event (Table 2). Dates and durations of winds along with the parameters of air humidity and temperatures of both air and soil are also given in Table 2. For summary, the first wind erosion event started on March 26th, 2010 at 15:30 and ended on March 27th, 2010 at 4:43 and the wind erosion process lasted for 13 h and 13 min.

The highest wind speed was 8 m/s and wind direction was southwest. The second wind erosion event started on March 28th, 2010 at 15:29 and ended on March 28th, 2010 at 20:06 and wind erosion process lasted for 4 h and 37 min. The highest wind speed was 13 m/s and wind direction was south-southwest. The third wind erosion event started on April 6th, 2010 at 14:11 and ended on April 6th, 2010 at 19:33 and wind erosion process lasted for 5 h and 22 min. The highest wind speed was 12.6 m/s and wind direction was south-southwest. Slopes of storm growth cycles in each wind event indicated that the third wind erosion event was stronger than the preceding ones (Figure 6).

The sediment amounts measured by both MWAC and BEST catchers at certain heights are given in Table 3. Our event-based field measurements showed that the MWAC catchers trapped the blowing sediments only at 0.20 m in all three events (0.002, 0.008, and 0.003 g, respectively, for events I, II and III), and there were no sediment measurements at the MWAC traps mounted vertically over winged poles at 0.2, 0.40, 0.60, 0.80, 1.00, 1.20, and 1.40 m heights. Unfortunately, this situation could not allow us to fit a mass distribution curve in order to estimate the mass flux.

On the other hand, the BEST catchers functioned quite satisfactorily in trapping sediments at each

Table 2. Climate data sets containing maximum and average wind speeds and direction for each wind erosion events observed during field experiments

Events	Start time	End time	D	U_{max}	t_{max}	PWD	$\bar{U}$
I	15:30, March 26	04:43, March 27	13 h, 13 min	8	–	SW	2.8–1.8*
II	15:29, March 28	20:06, March 28	4 h, 37 min	13	16:19	SSW	4.7
III	14:11, April 6	19:33, April 6	5 h, 22 min	12.6	19:02	SSW	3.7

D – duration of the event; U_{max} – maximum wind speed observed during the wind event (m/s); t_{max} – time at which U_{max} was recorded (h:min); $\bar{U}$ – daily mean wind speed (m/s); PWD – daily prevailing wind direction; * since max, min and mean values of wind speed, humidity and temperature were given on a daily basis, two values appeared for event I, which lasted for two days, standing for March 26 and 27, respectively, for each parameter recorded in the weather station

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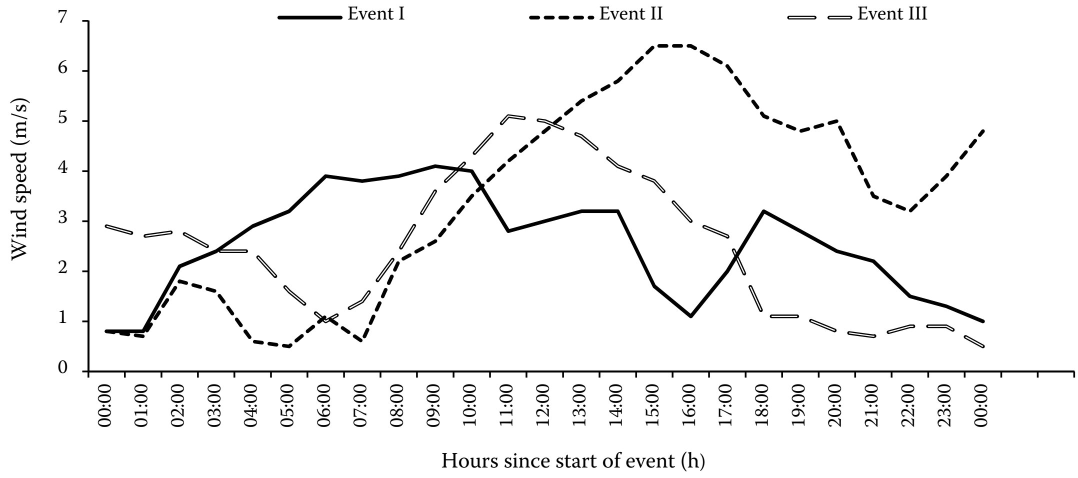

Figure 5. Hourly variations in mean wind speed since the onset of each event occurring in the Karapinar region during the research period

height, allowing curve fitting and calculations by the integration of a given exponential function (Eq. (2)) (Figure 4). BEST was able to catch wind-blown sediments up to the height of 1.00 m in the events I and II and up to the height of 1.20 m in the event III while there were no sediment measurements at the height of 1.40 m for all events (Table 3). Eventually, all calculations for estimating mass flux and total mass transport occurring during the wind erosion events from the experimental plot of 50 × 50 m were performed by BEST (Table 3). Sediment transport rates (Q_r, kg/m) predicted by integration (Eq. (3)) using exponential curves ($q_{z.\exp}$, kg/m) (Eq. (2)), which provided the best fits for all three events with r^2 values of 0.956, 0.835, and 0.987 (Figure 4), were 0.202, 0.581, and 0.180 kg/m, respectively. Accordingly, the event-based total mass transports ($Q_{t,}$ kg) estimated by (Eq. (3)) were 12.619, 36.329, and 11.220 kg for events I, II, and III, respectively (Table 3).

In summary, during the experimental period March 15–April 29, 2010, the highest sediment transport was observed at event II (36.329 kg), followed by event I (12.619 kg) and event III (11.220 kg) with the average wind speeds of 13.0, 8.0, and 12.6 m/s, respectively (Table 2). These results implied that not only wind speed but also other soil properties, such as

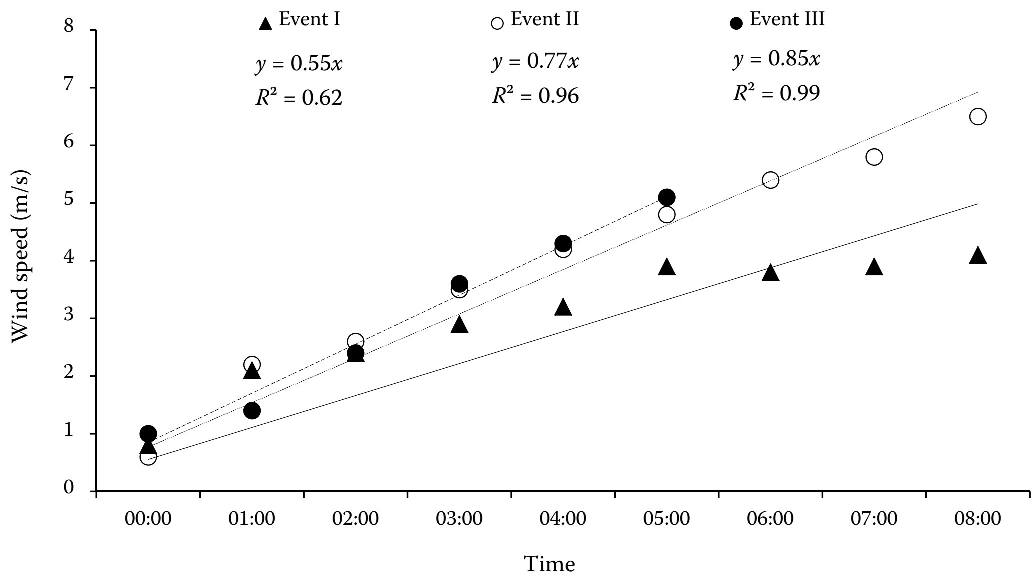

Figure 6. Slopes of storm growth cycles in each wind event

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Table 3. Sediment flux values (q_z, kg/m^2) at set trap heights by the BEST and MWAC traps and the calculated sediment transport rate (Q_r, kg/m) and total mass transport (Q_t, kg) obtained from event-based *in situ* measurements

z (m)	m (g)						q_z (kg/m^2) (Eq. (1))					
	event I		event II		event III		event I		event II		event III	
	BEST	MWAC	BEST	MWAC	BEST	MWAC	BEST	MWAC	BEST	MWAC	BEST	MWAC
0.2	0.069	0.002	0.198	0.008	0.083	0.003	0.2875	0.0520	0.8250	0.2080	0.3458	0.0780
0.4	0.037	–	0.065	–	0.042	–	0.1542	–	0.2708	–	0.1750	–
0.6	0.016	–	0.043	–	0.011	–	0.0667	–	0.1792	–	0.0458	–
0.8	0.006	–	0.026	–	0.004	–	0.0250	–	0.1083	–	0.0167	–
1.0	0.001	–	0.001	–	0.002	–	0.0042	–	0.0042	–	0.0083	–
1.2	–	–	–	–	0.001	–	–	–	–	–	0.0042	–
Q_r (kg/m) (Eq. (3))							0.202	–	0.581	–	0.180	–
Q_t (kg) (Eq. (4))							12.619	–	36.329	–	11.220	–

m – sediment weight (g); *z* – trap placement height; BEST – Basaran and Erpul Sediment Trap; MWAC – Modified Wilson and Cook trap

the presence of loose particles at the soil surface and soil moisture content during the wind events, were decisive for quantifying the magnitude of the mass fluxes. For example, in event I more sediment flux occurred than in event III although the wind speed was much lower at event I. In the sequence that the three events took place, the wind erosion dynamics could be explained both by the soil moisture conditions that decreased the threshold friction velocity of wind and by the amount of loose soil particles available for wind erosion at the soil surface. However, the aim of this field research was not to discuss this dynamics but to assess the field performances of the BEST and MWAC aeolian sediment catchers. Therefore, the field-based experiments were merely designed to trap wind-blown sediments by either catcher synchronously under the same conditions.

Our field-based experiments revealed that there were significant discrepancies between the vertical flux profiles of the particles measured by BEST and those by MWAC, which could not trap wind-blown particles at 0.40, 0.60, 0.80, 1.00, 1.20, and 1.40 m heights (Table 3). These results complied notably with those of wind tunnel experiments (Basaran *et al.* 2011), conducted for comparative performances of the MWAC and BEST catchers in trapping wind-blown sediments. By a set of experiments in the ICE wind tunnel, Basaran *et al.* (2011) showed that the efficiency of BEST was higher than that of MWAC and it functioned much better than MWAC in capturing dust-sized particles. Particularly, the coefficient of variation revealed that the efficiency of BEST varied less with particle size. Youssef *et al.* (2008) reported that MWAC traps were not highly efficient for fine particles in wind tunnel experiments.

Actually, for more accurate assessment of mass flux density profiles across height, the lowest sampler should be as close to the soil surface as possible. Since the BEST was mounted vertically over the pools, minimum available measurement height was 0.20 m. BEST has a cyclone system. Efficiency of the horizontal position of cyclone systems has not been tested yet; therefore WAC was also mounted vertically. Actually most of those studies were conducted in wind tunnel with the limited roughness height and also field studies were done uncovered and minimum roughness conditions. Since tillage-induced roughness was high in our plot, the lowest trap height of 0.20 m was sufficient for modelling the sediment flux.

Complementarily, a detailed analysis by processing electron microscopy images of the particles (Figure 7) showed that almost all of the sediments trapped by BEST at heights above 0.60 m were finer than 100 mm, which points to the transport by mostly short-term suspension (~ 20–70 μm) and partially by saltation (~ 70–500 μm) (Nickling & McKenna-Neuman 2009) given the fact that the percentage of particles finer than 50 mm was about 26% in the experimental plot after the percentage of very fine sand was deducted (Table 1). Figure 7 also microscopically pictures that particles become increasingly finer in size at the trap heights of 0.60, 0.80, and 1.00 m (Figures 7d–f) when compared with those of 0, 0.20, and 0.40 m (Figures 7a–c).

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Especially in the current study on comparative assessment of the field performances of the BEST and MWAC aeolian sediment catchers in sandy-loam soils, the MWAC was not able to trap sufficient amounts of short-term suspension particles in three different wind events to perform the sediment calculations by vertical mass fluxes. On the other hand, much better performance of BEST in catching these particles (< 100 μm) could be completely related to its design characteristics based on fluid-mechanical interactions between air flow and gravity of wind-blown particles (Basaran *et al*. 2011). First of all, a larger inlet size of BEST, which is 6 times greater than that of MWAC (0.000 24 m^2 and 0.000 04 m^2, respectively), allows it to function effectively in pulling dust laden air flux through its unit surface area. Secondly, its cyclone design, during the flow of air through the BEST system, could reduce turbulence within the trap, causing smaller dust-sized particles to settle much more rapidly due to the accelerated gravitational force achieved by a rapid air rotation. This means that there is a very low risk of flow-out loss of trapped particles from the BEST catcher. Finally, a narrower area of the conical cyclone body of BEST could result in a greater outlet air velocity than inlet velocity since the velocity of trapped air gradually increases as it turns around that part of the trap, further giving rise to a reduction of stagnation pressure at the catcher inlet. This effect will be straightforwardly related to the body sections of the used traps, where the trapped air tends to stagnate. These lengths of circular sections of the BEST and MWAC catchers were 50 mm and 130 mm, respectively. Explicitly, the greater the wind speed, the quicker the stagnation pressure could develop inside the MWAC circular body and the longer the circular part, the stronger the stagnation pressure could build up and the less dust laden air flux enters through inlet of the trap. However, BEST could significantly hinder the growth of stagnating air mass by encouraging air to flow more quickly along its 74 mm conical section and could provide a better air flow in and out of the trap. Basaran *et al*. (2011) stated that, as wind speed increased, the efficiency of BEST increased while that of MWAC decreased.

High efficiencies and field performances of MWAC traps in the previous studies of Goossens *et al.* (2000), Goossens and Offer (2000), Mendez *et al.* (2011),

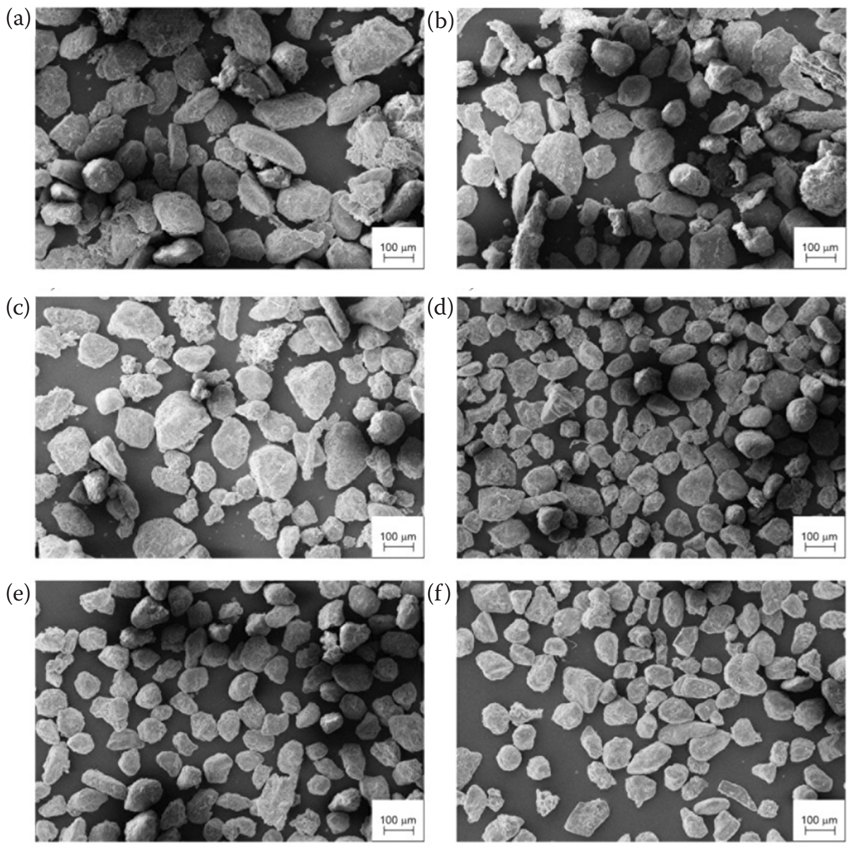

Figure 7. Size of trapped sediment particles for different heights: (a) 0 m, (b) 0.20 m, (c) 0.40 m, (d) 0.60 m, (e) 0.80 m, (f)1.00 m

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and Poortinga *et al.* (2013) are rather different from the results of this study and results of wind tunnel experiments conducted by Basaran *et al.* (2011). The former group found the MWAC efficiencies quite satisfactory and usually more than 80% while the latter reported that the MWAC efficiencies were not more than 52% for different wind speeds and sediment sizes, and particularly, it was 12% for particles smaller than 100 µm. These contrasting results suggest that since the field performance of a trap could vary with particle sizes and the related wind erosion processes (Nickling & McKenna-Neuman 2009), there is still a need for doing more process specific research on this. Simply, any catcher, which functions satisfactorily well in trapping different particle sizes transported by different processes of wind erosion, particularly by saltation and suspension, could help meet the needs of those conducting quantitative field research.

CONCLUSIONS

In this comparative evaluation of the field performances of the BEST and MWAC aeolian sediment catchers, we found that BEST showed potentially promising results in trapping both sand and dust size particles. Although weak wind erosion events occurred in the research period, adequate accounting for the wind erosion processes of both saltation and short-term suspension were achieved. Able to trap wind-blown particles up to 1.20 m above soil surface for each event, it also allowed us to make quantitative estimation of soil losses by wind erosion from the research plot. On the other hand, MWAC did not allow us to describe possible soil erosion processes by specific particle sizes during the events for it could hardly trap adequate particles at experimentally set heights, which further prevented us from vertically profiling any mass flux for soil loss estimation. Horizontal efficiency of BEST trap should also be investigated in further studies. Such studies may allow researchers to accurately measure the wind erosion.

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